The Electrical Industry's Weekly Magazine October 19, 1959

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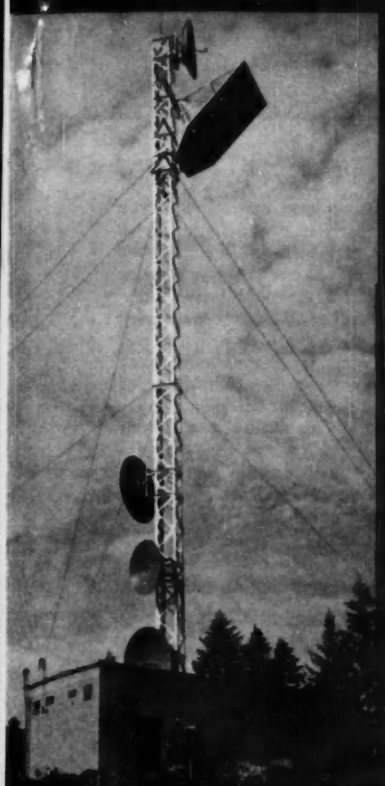
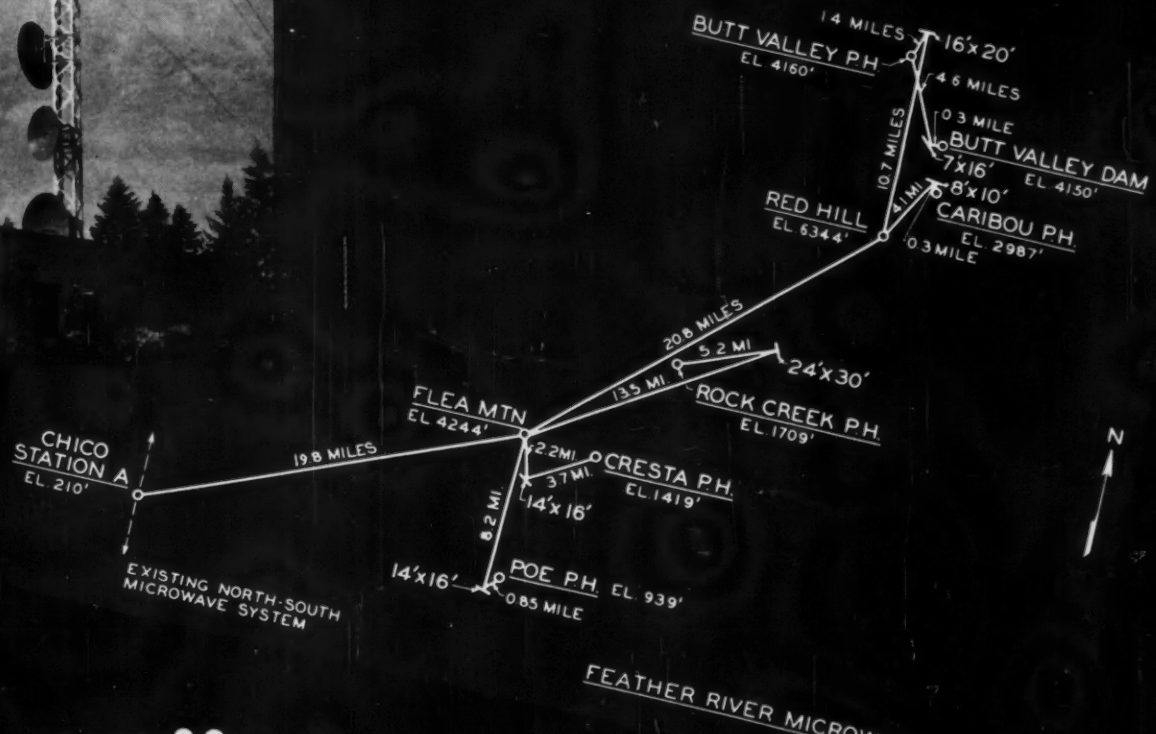


Flea Mountain Repeater Links "Cushion Shot" Microwave System



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Will Consumer Credit Boost the Boom? . . . P

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ADVERTISEMENT

General Electric's
J. W. Seaman, General Manager,
Power Transformer Department,
answers some questions on . . .

• New concepts in the power transformer business
• Benefits for utilities

Q. ***Mr. Seaman, what is General Electric doing to make progress in power transformers pay off for utilities?***

A. Quite a bit. Right now we are announcing an important extension of our Preferred Design transformer line that will bring many outstanding benefits to electric utilities.

Q. ***What are the major features of this new G-E PD Transformer Program?***

A. Actually, they begin with a new way of doing business . . . and a new approach to developing and producing power transformers. Let me explain. For some years now, our greatest challenge has been to find a solution to the seemingly always-rising labor and material costs. A partial solution to this problem was effected in 1957 when Preferred Design transformers were introduced. Using a 705 computer, we made an embryo attempt to introduce product uniformities into units rated up to 50 mva and 138 kv. With this start, techniques of more mechanization, sub-assembly work, and repetitive operations were utilized.

Now, we go a step further. Inflationary trends, still with us, dictated the need for further efforts—a new business approach.

Q. ***How would you explain General Electric's new business approach on power transformers?***

A. Simply this. General Electric has extensive engineering and manufacturing skill. However, because of the tradition of making custom-built or individually tailored transformers, our major advances have largely been limited to engineering accomplishments. Our new goal was to develop a concept whereby our latent manufacturing abilities could be applied to power transformers.

To do this, we have extended our Preferred Design program to include units rated as high as 250,000 kva and 230 kv. We have developed three styles of transformers for the three major application areas, i.e., large substation, transmission-tie and generator step-up units.

The uniform mechanical features and accessories for each type are truly utility-preferred because of our extensive product planning efforts to determine what the *industry* wanted. With these uniformities in our products, we are able for the first time to apply G.E.'s full manufacturing knowledge to power transformers. And, because of our computer, we are still able to offer complete electrical design flexibility to best meet specific requirements within each application area.

Q. ***How about those utility benefits?***

A. G-E power transformer users will benefit because our new concept has to, and does 1) combat the inflationary trend and protect or improve purchasing power, 2) reflect customer-preferred features and practices, and 3) simplify our product.

Q. ***Can you give some examples of that "product simplification"?***

A. Obviously, the uniform mechanical features and accessories are one example. Another is that for years we built different tanks, depending upon cooling method required. We have now relegated cooling to its proper place as an accessory where it does not interfere with our basic attempt to get optimum transformation. Cooling packages are now always placed at the end of the new tank which is suitable for all types of coolers. It isn't until the cooling equipment is to be attached that our assembly people must know which cooling method is specified.

The advantages of building essentially one type of tank are, I believe, readily apparent.

Q. ***What are the "pay-offs"?***

A. In the short range, operating people will see many new and better items in power transformers, such as ease in uprating, better coolers, easier installation, 40 percent faster deliveries, and others. Utility engineering people will be aided because our PD program permits valuable data on large units to be published for estimating and planning purposes. And, we can also supply, with our propositions, drawings that are approved for construction purposes—final planning or substation designs can begin immediately after an order is placed for a G-E unit.

Purchasing people will, I am sure, appreciate the addition of many features which formerly had to be specified. Now standard, these save dollars and some detailing work. Also, our progress to date in the areas just described permits us to realign net published prices which, averaging the few increases with the many decreases, will mean an over 5% downward adjustment for the entire line.

To utility management people particularly, we further state that this program should permit us to make effective manufacturing economies. If the utility industry then provides volume support and if inflation continues at the current rate, net published prices which haven't been increased since mid-1957 should remain near their present levels for at least the next several years.

Q. ***This sounds like every utility man connected with the purchase or use of power transformers could profitably explore these advantages. How about further information?***

A. Our General Electric Sales Engineers have full information. They, or the local G-E Apparatus Sales Offices, should be contacted. 301-404

More Power to America

GENERAL ELECTRIC

Electrical World

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 152, No. 16 OCTOBER 19, 1959

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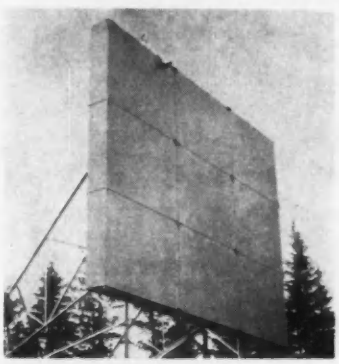

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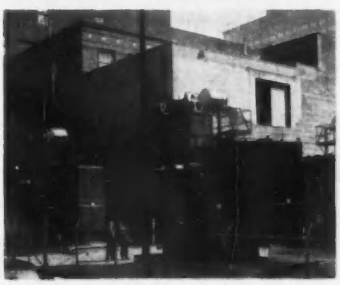

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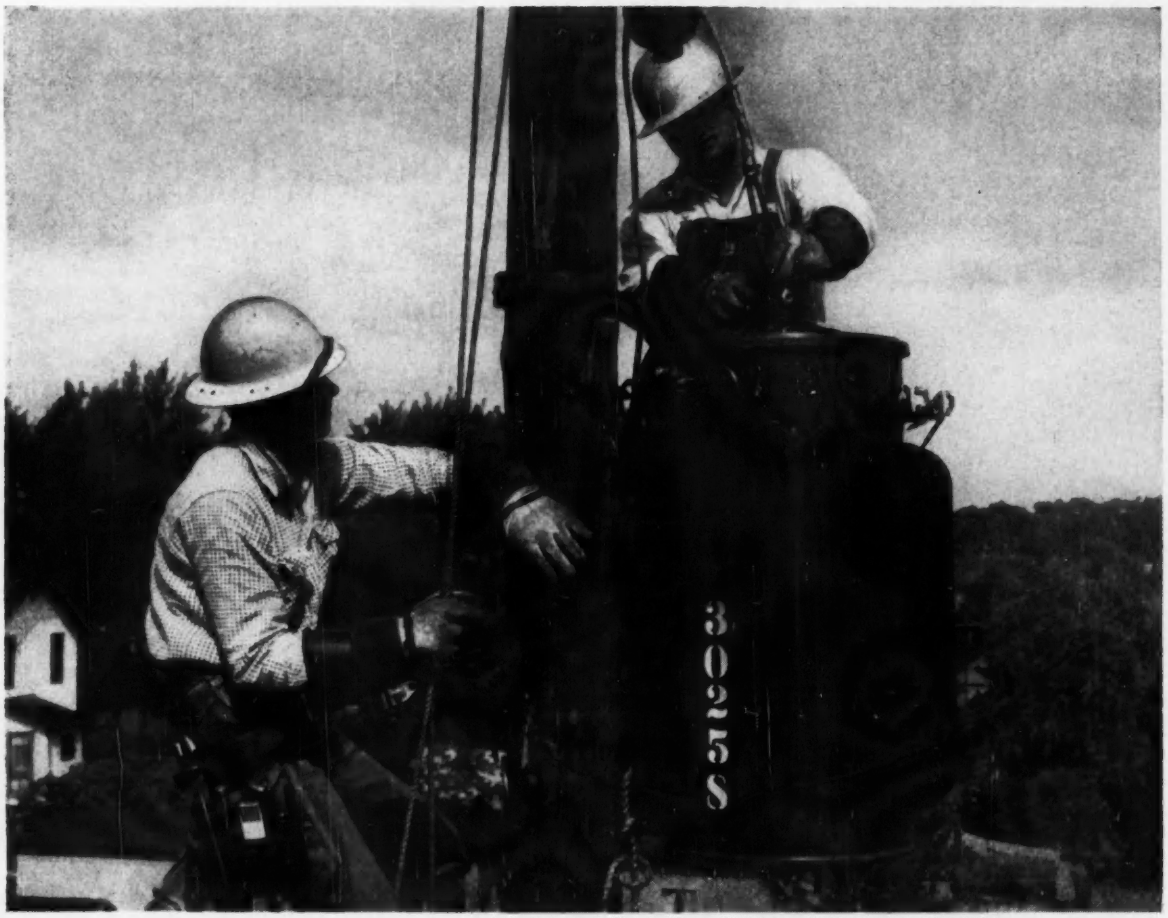

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LETTERS

"Wee People" Taunt Power Line Builders

To the Editor:

This will bring you up to date on some aspects of rural electrification in Ireland.

The Irish Electricity Supply Board has already connected 286,000 rural customers out of a possible 300,000 that would accept supply.

The Irish Board has tackled rural electrification with commendable energy in a country with a low economic standard. Every possible economy is made. Rights of way can be enforced by law to provide minimum route lengths. A small group of overhead line erectors, with minimum fixed costs, is augmented as needed by local labor.

Supplying a country with a population of no more than 2½ million people, with agriculture as almost the only major industry, has obvious economic headaches. Capital is hard to come by.

But the Electricity Board has run into other problems which are perhaps unique to Ireland. A Board engineer related to me a true story of the fairies (the "little people") who apparently objected to his new pole line crossing a traditional fairy ring.

After erecting a run of poles one day, the next day he found them uprooted. He learned that a local farmer, as well as the "little people," objected to this compulsory right of way.

But quite seriously he was informed that it was the "little people" who had pulled out the poles—and who did it again on the second night.

The engineer, knowing his consumers, went to the village pub and while quaffing Irish whisky happened to mention to the villagers that the force of the "little people," who had twice uprooted his poles in the night, was too strong for the Supply Board. He would have to abandon the project because there was no other available route for the line. He just couldn't resist the fairies.

As many of the villagers had had their cottages wired in anticipation of receiving a supply in the near future, word must have been passed to the fairy world by some uniquely Irish method. Next day the engineers found the poles re-erected—and they stayed that way.

You may be interested to know, too, that the Irish Republic imports a share of its power supply from North Ireland which is still under British control. You will recall that Orange is the color symbol of the Ulstermen of Northern Ireland. The men in the Republic happily refer to this transaction as importing "Orange juice."

J. H. M. Sykes
Special Correspondent

71 Chaucer Road
Bedford, England

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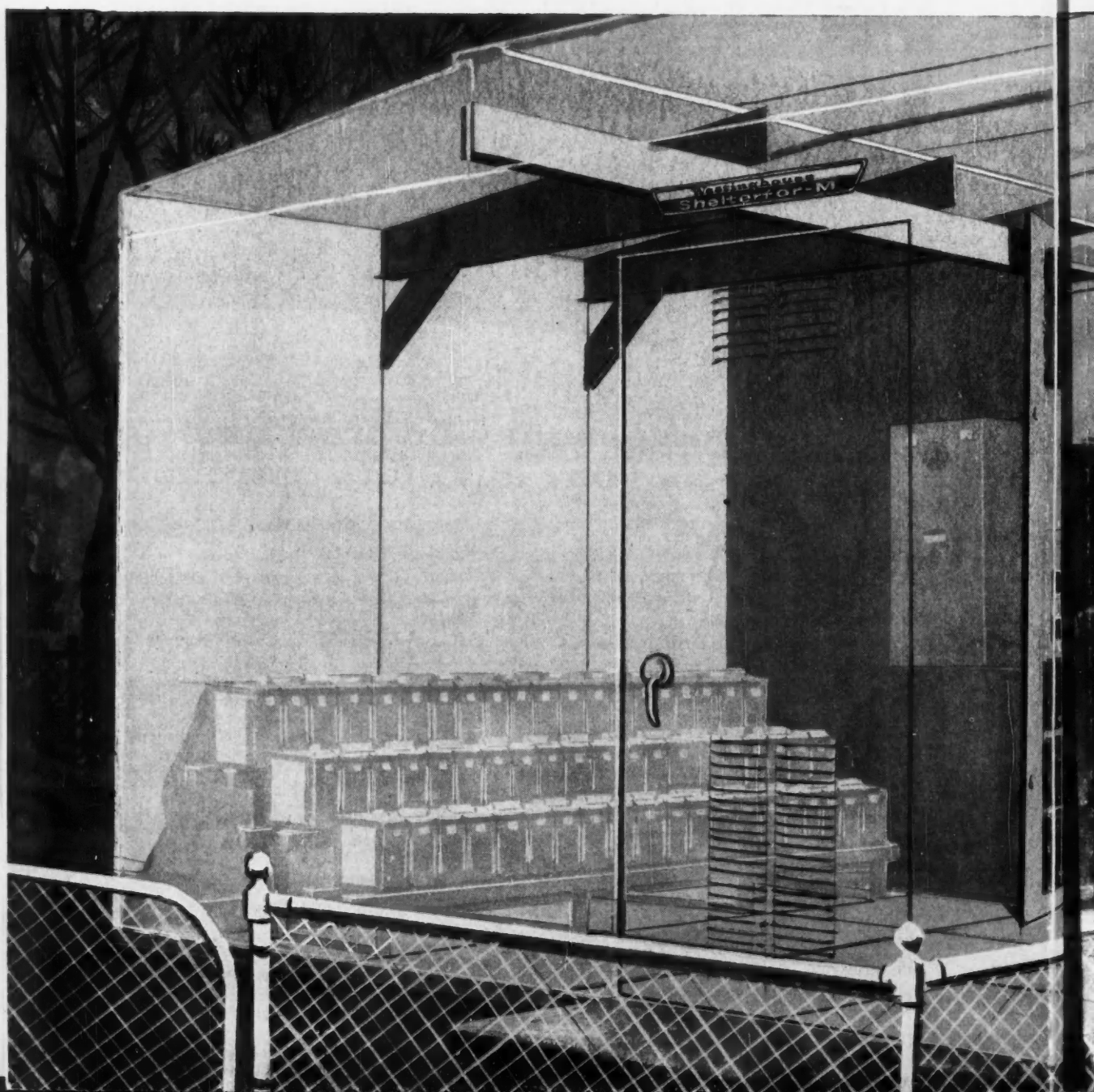

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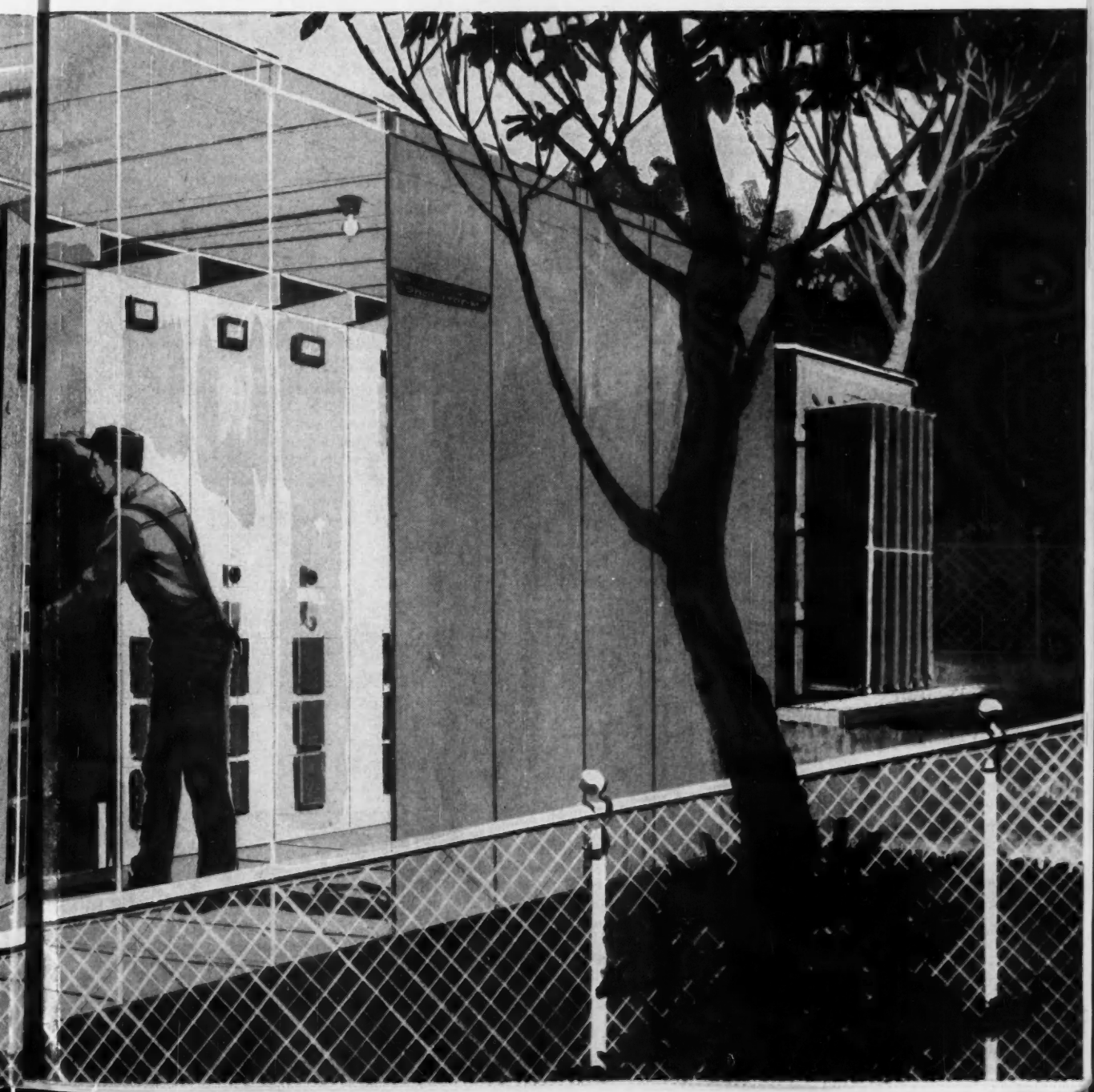

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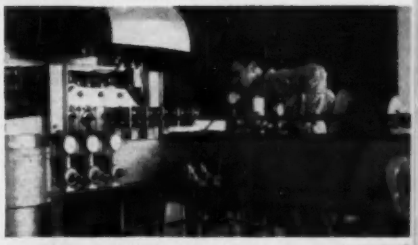

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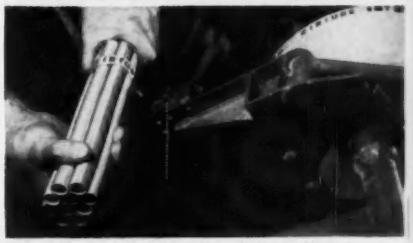

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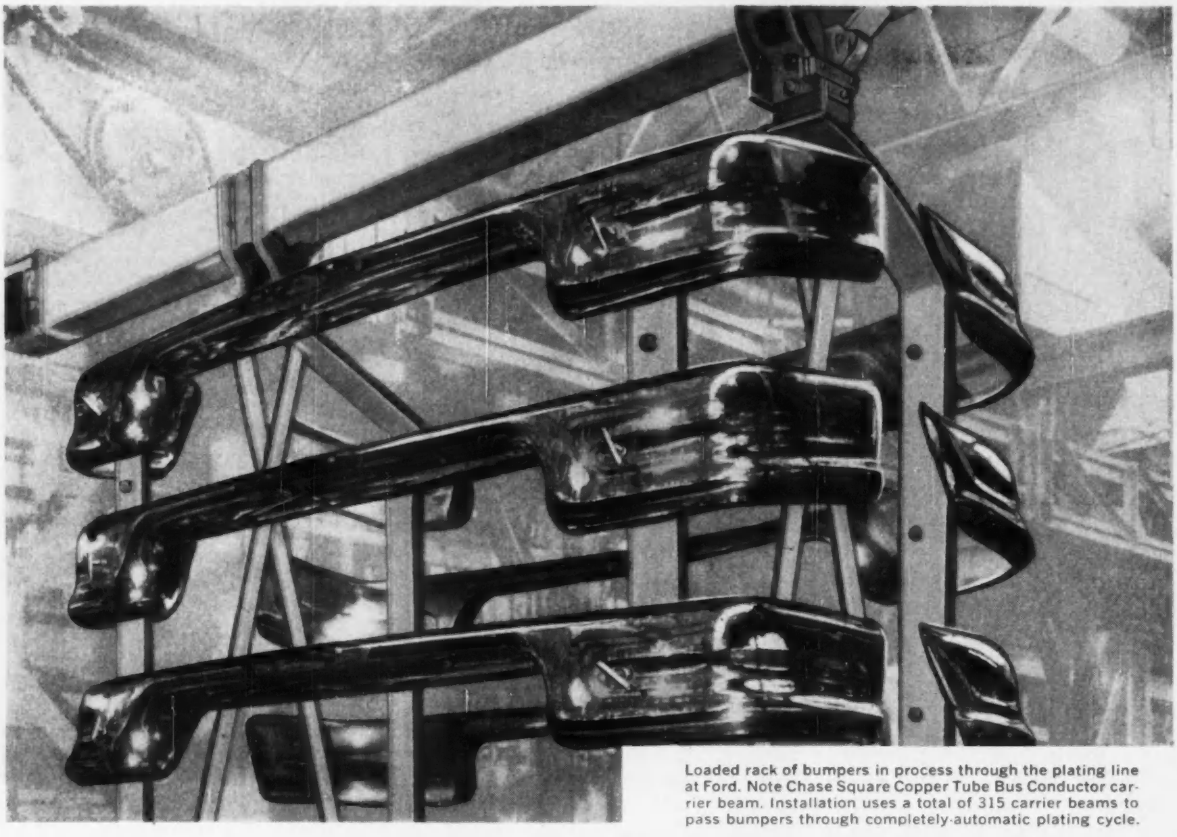

Loaded rack of bumpers in process through the plating line at Ford. Note Chase Square Copper Tube Bus Conductor carrier beam. Installation uses a total of 315 carrier beams to pass bumpers through completely-automatic plating cycle.

UNIQUE BUS CONDUCTOR INSTALLATION OF CHASE® COPPER SERVES DUAL PURPOSE AT FORD PLANT

On the vast plating lines handling automobile bumpers at Ford Motor Company, Chase Square Copper Tube Bus Conductor is serving in an all-new way. Each carrier beam is made of Chase Square Copper Tube Bus Conductor 6″ square x ½″ wall x 13′5″ long.

First, the square copper tube bus conductor replaces a complex beam, formerly fabricated of several solid copper bar members. It performs the dual function of carrying the electric current and serving as a structural support from which the plating racks are suspended...thus effecting economies in fabrication, installation and operation of the lines. Space is saved; operations and maintenance are simpler and more efficient.

Second, Chase Square Copper Tube Bus Conductor carries electrical current...with these advantages:

- **high electrical and thermal conductivity**
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- **great mechanical strength in all directions**
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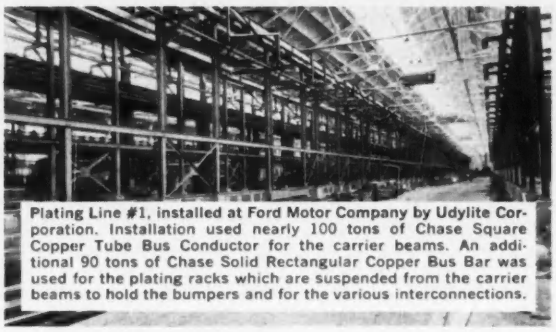
However *you* use copper bus conductor, your nearest Chase office can serve you; or write Chase at Waterbury 20, Conn.



Plating Line #1, installed at Ford Motor Company by Udylite Corporation. Installation used nearly 100 tons of Chase Square Copper Tube Bus Conductor for the carrier beams. An additional 90 tons of Chase Solid Rectangular Copper Bus Bar was used for the plating racks which are suspended from the carrier beams to hold the bumpers and for the various interconnections.

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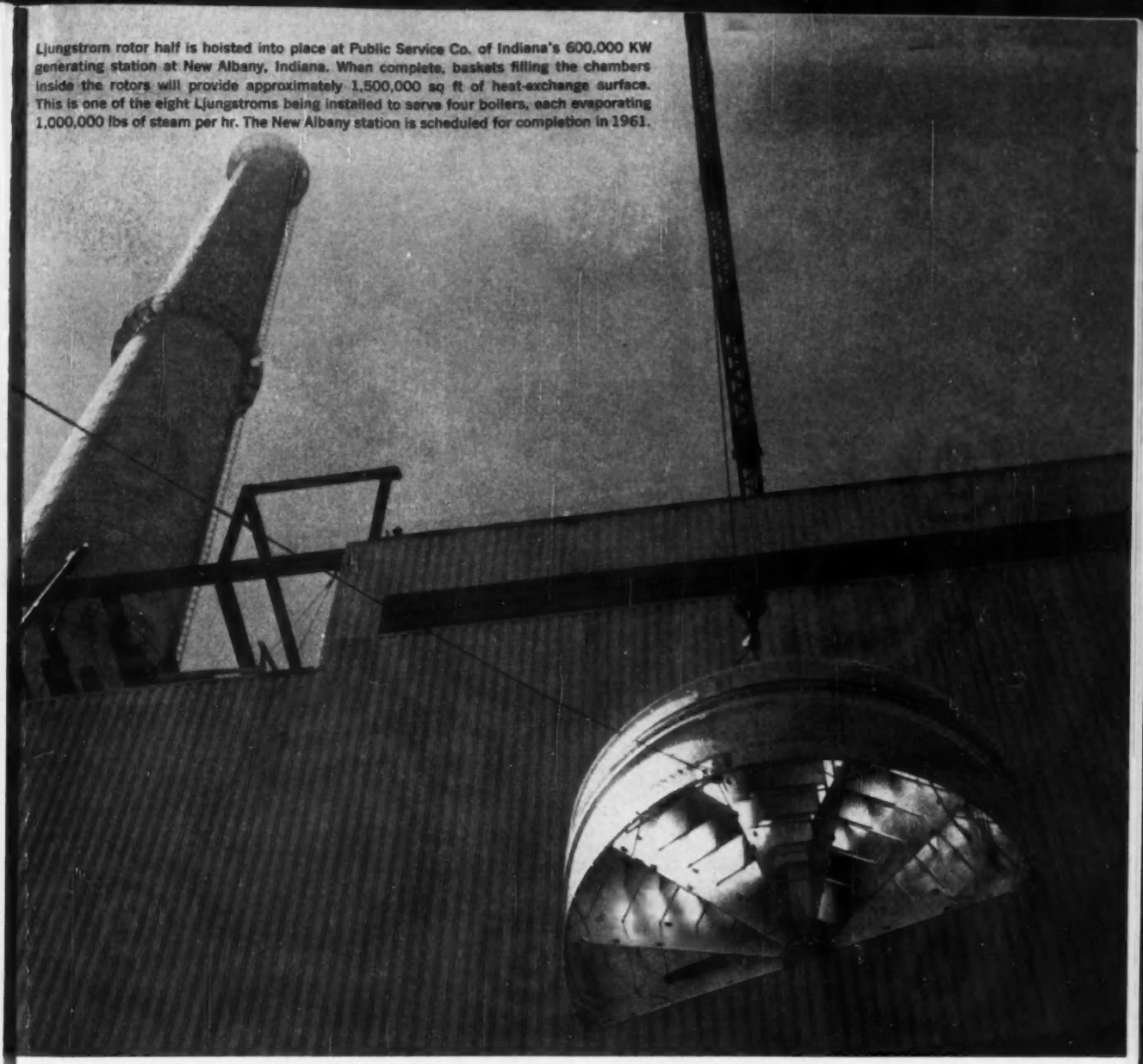

Ljungstrom rotor half is hoisted into place at Public Service Co. of Indiana's 600,000 KW generating station at New Albany, Indiana. When complete, baskets filling the chambers inside the rotors will provide approximately 1,500,000 sq ft of heat-exchange surface. This is one of the eight Ljungstroms being installed to serve four boilers, each evaporating 1,000,000 lbs of steam per hr. The New Albany station is scheduled for completion in 1961.

BEHIND NEW ALBANY'S **LJUNGSTROMS®** —**LIFETIME AIR PREHEATER SERVICE**

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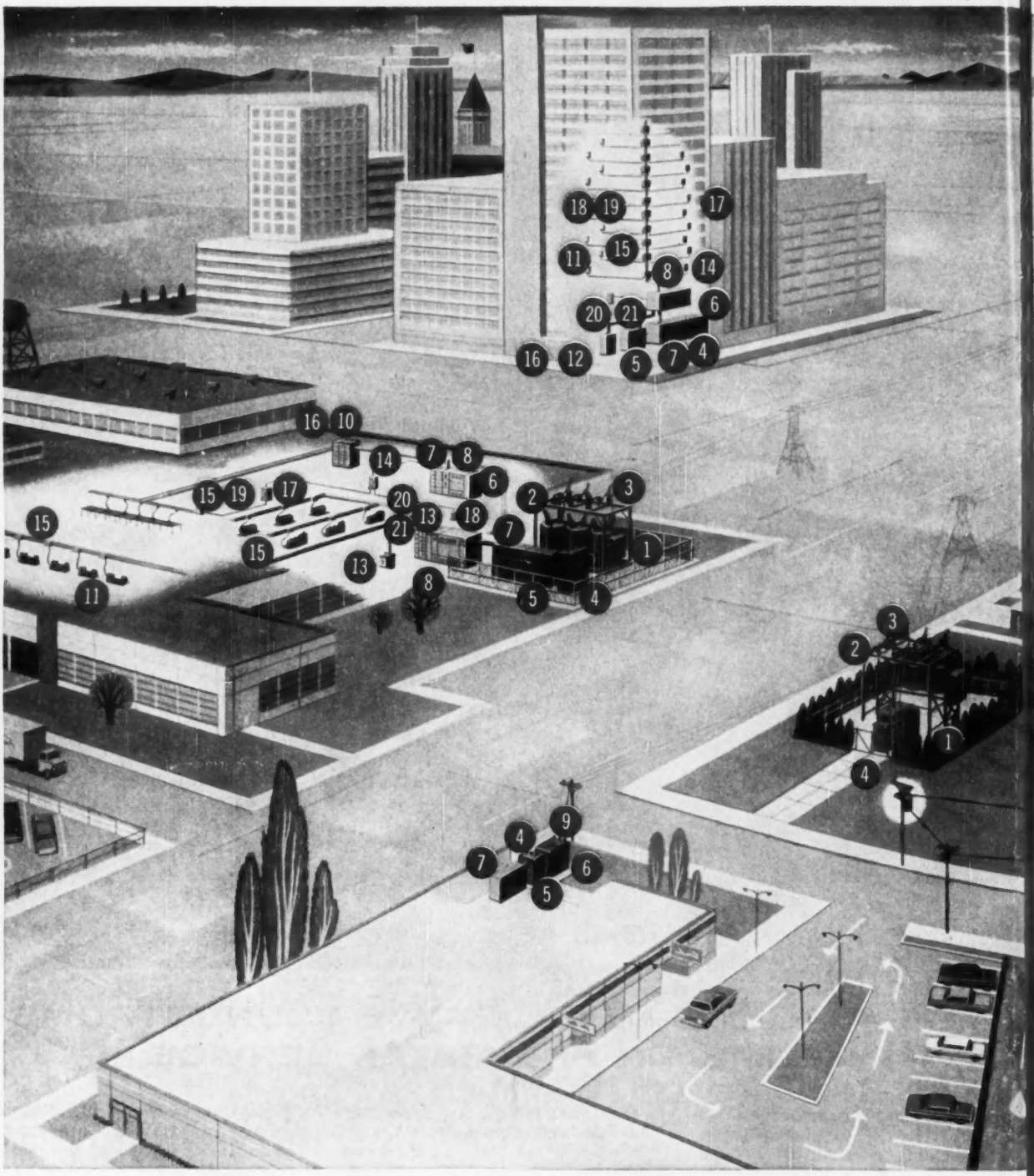
Lifetime Air Preheater Service means that Ljungstrom engineers make regular calls *throughout the life of each unit.* They check to make sure your Ljungstroms are working at top efficiency, and that they'll continue to work that way. This service policy covers all Ljungstroms—right from the very first installation made in 1923.

But that's not all. Air Preheater provides first-rate *emergency* service, too. For instance, a Ljungstrom customer in the southwestern U.S. recently called on a Wednesday night for replacement parts. Air Transport looked like the fastest way, but schedules indicated a minimum three-day delivery time. So Air Preheater loaded the parts on a pickup truck, and their men drove them more than 1,000 miles to their destination...34 hours straight driving. The parts were installed and in service by Friday morning.

Fast response to emergencies and regular inspection of Ljungstrom installations are two of the many advantages Air Preheater provides. Another is expert knowledge of boiler and preheater problems gained from over 35 years' experience. Perhaps these reasons explain why 9 out of 10 preheaters sold today are Ljungstroms.

THE AIR PREHEATER CORPORATION

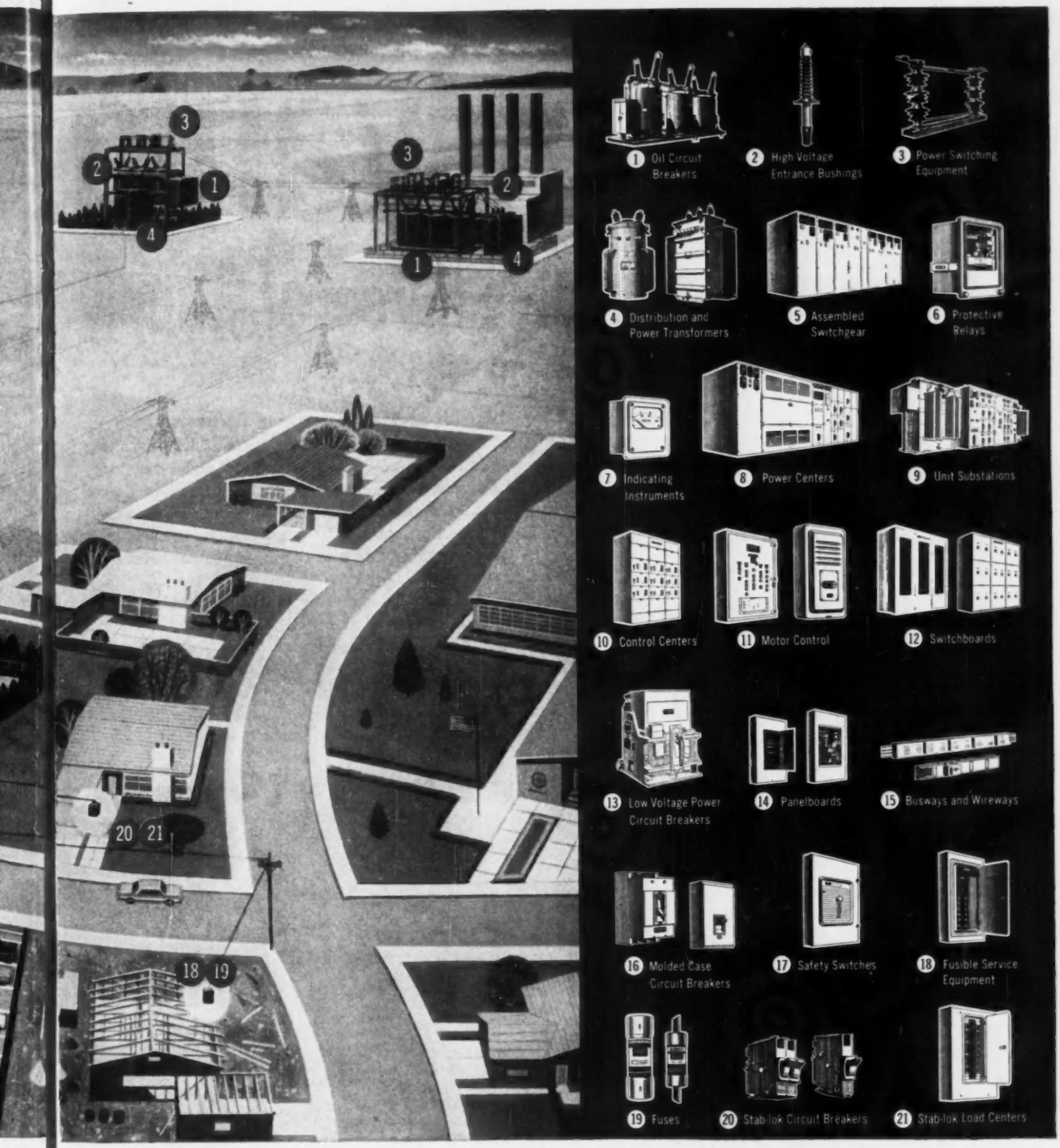
60 East 42nd Street, New York 17, N. Y.



A complete line of quality electrical

FPE **FEDERAL PACIFIC ELECTRIC COMPANY**

General Offices: 50 Paris Street, Newark 1, New Jersey



distribution and control equipment

FOR HOMES, COMMERCIAL BUILDINGS, INDUSTRIAL PLANTS and UTILITY SYSTEMS

Pennsylvania

*Single Source of Supply

Single- and Three-Phase Ratings

With the recent introduction of its single-phase Pole Star Regulators, Pennsylvania Transformer can now provide utilities with a complete line of voltage regulating equipment—from the smallest single-phase pole-type regulator, to three-phase load tap changing and regulating transformers as large as 250,000 kva.

Included is a Pennsylvania innovation that has captured the attention of the entire electrical industry: the Phase-Isolated LTC transformer. This new product—a three-phase transformer that provides individual voltage regulation of each phase—offers a sound solution to many substation application problems.

PENNSYLVANIA

Pole Star Regulator for Platform or Pad Mounting

Pole Star Regulator for Pole Mounting

SINGLE-PHASE POLE STAR REGULATORS

Available in 27 single-phase distribution ratings for pole-top, platform and station installations. The Pole Star Regulator combines Pennsylvania Transformer's highly successful experience in two related fields: distribution transformers and power-transformer load tap changers.

SSOS*

for all load tap changing equipment

Regulation in 32 Steps of 5/8%

Pennsylvania LTC equipment usually provides plus or minus 10% regulation in 32 steps of 5/8% each, although variations can be made to suit individual requirements. The various mechanisms used are based on design principles that have been proved in hundreds of installations over a period of many years.

Service-Simulated Test Runs

All production of LTC mechanisms is subject to strict quality control—with C.A.A.D. (the Control Apparatus Assembly Department) having complete responsibility for every step from the manufacture and testing of components through the final assembly of mechanisms on regulators and load tap changing transformers.

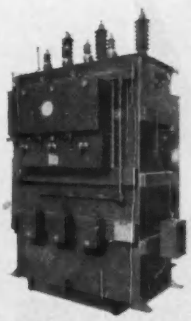
To further assure that the high standards long associated with the name Pennsylvania Transformer are maintained, each LTC mechanism undergoes service-simulated test runs—as many as 5000 tap changes for larger units.

Write for Descriptive Bulletin

Pictured on these pages are representative examples of Pennsylvania Transformer voltage regulating equipment. For details of the load tap changing mechanisms used with these products, write on your company letterhead for Bulletin 81. Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pennsylvania.

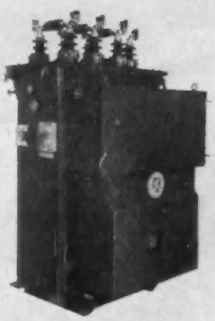
McGRAW-EDISON

TRANSFORMERS AND REGULATORS

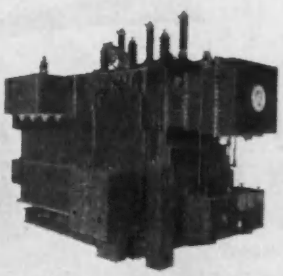


PHASE-ISOLATED LTC TRANSFORMERS (patent pending)

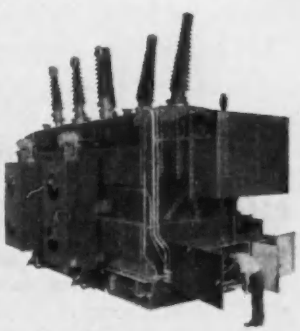
A three-phase LTC transformer that offers all the advantages and flexibility of single-phase regulation. Each phase has an individually controlled LTC mechanism, plus a bypass and grounding switch. The unit pictured is 3750/4687 kva.



225-kva Step Voltage Regulator



50,000-kva LTC Transformer



150,000-kva LTC Autotransformer

THREE-PHASE STEP VOLTAGE REGULATORS, LTC TRANSFORMERS, LTC AUTOTRANSFORMERS AND REGULATING TRANSFORMERS

The complete three-phase line includes step voltage regulators from 120 through 2500 kva, load tap changing transformers from 750 through 250,000 kva, and load tap changing autotransformers and regulating transformers from 10,001 through 250,000 kva.

In 1927, Philadelphia Electric's "EHV" was 220 kv...its choice of insulators: Lapp "high-strength" suspension units

The important Conowingo-Philadelphia connection, constructed by Philadelphia Electric Co. in 1927, is a two-circuit line, on separate towers, at 220 kv. The "high-strength" insulators selected for one of these lines were Lapp 10" discs, spaced 5¾", with galvanized forged-steel caps and ball bolts, minimum M & E strength catalogued as 18,000 lbs. 32 years later, this line still is "up-to-date" in design; its original insulators are still in service "without trouble, and without reason to expect future trouble," say company officials.

IN LAPP SUSPENSION UNITS... HIGH STRENGTH AND LONG LIFE GO TOGETHER

Selection of suitable insulators poses no such serious problem to designers of today's and tomorrow's EHV transmission systems as had to be faced by their predecessors of a generation ago. The principle that high strength and long life can both be built into a suspension unit, vigorously challenged through the 1920's, was established. Lapp units, built for such installations as shown above, met strength requirements; their service records prove their reliability and durability.

Lapp 25,000-lb. units are offered today for your EHV and other high-mechanical-loading requirements, both in conventional 10" discs and fog-types. Their proved design, their uniformity of mechanical and electrical characteristics and their service records merit your confidence in their selection and specification for lines of highest operating security and trouble-free long life.

Lapp

Lapp Insulator Co., Inc., Le Roy, New York.

The Electrical Week

FUTURE NEWS ▶ **A group of Southern utilities will try to boost residential usage** by capitalizing customers service entrances up to the distribution panel in new homes; existing homes will be eligible for the plan if a major appliance is added or new wiring installed.

LATE NEWS ▶ **Washington Wire** . . . FPC rejects proposal by Central Vermont PS to sell 46 miles of transmission line to its sub, Vermont Electric Power . . . Interstate Commerce Commission allows further freight cut on coal to Florida of 86¢. This, along with other recent reductions, cuts freight costs from $6.80 to $3.80 a ton.

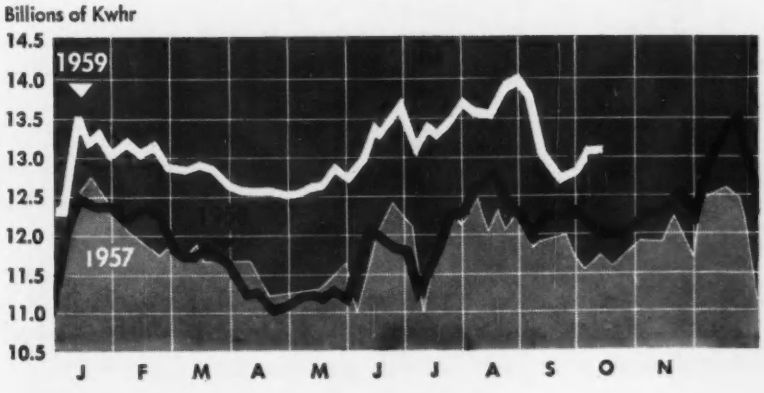
Rochester G&E celebrates 10th year of operation as a separate utility company by having a party for its 2,500 employees and families.

New hydrogen fusion plan may lead to power production, according to scientists at University of California's Los Alamos laboratory. It involves using a magnetic gun to drive nuclear fuel into magnetic field which acts as a "bottle" in which fusion reaction occurs.

Around the States . . . Three Illinois co-ops plan to build 99-Mw, $26.6-million power plant near Crab Orchard Lake within three years . . . Idaho Supreme Court rules state funds cannot be used to reimburse utility companies for cost of relocating facilities because of highway construction . . . Missouri PS asks for $527,217 yearly rate hike . . . Central Maine Power takes rate case to court. Company received yearly rate hike last July of $898,000, after requesting $2,794,000 . . . Thurston County PUD, Wash., reaffirms plans to acquire facilities of Puget Sound P&L within the county.

Management changes . . . A. W. Althouse elected president of Southern California Ed subsidiary, Associated Southern Investment Co.

WEEKLY POWER OUTPUT—UP 8.4% (Week ending Oct. 10), Kwhr 13,086,000,000



Per Cent Change From Previous Year

	Sept. 26	Oct. 3	Oct. 10
Total U. S.	+ 4.3	+ 9.3	+ 8.4
New Eng.	+ 4.5	+ 7.8	+ 5.4
Mid. Atlan.	+ 7.5	+12.1	+13.1
Cent. Ind.	+ 4.5	+ 5.3	+ 6.1
West Cent.	+ 5.1	+ 7.1	+ 5.0
Southeast	+ 3.9	+ 7.4	+ 8.3
South Cent.	+10.9	+29.9	+15.0
Rocky Mount.	+ 6.0	+ 4.0	+ 2.5
Pacific			
NW	+ 9.1	+12.1	+ 9.6
SW	+ 6.5	+ 3.2	+ 6.8

Seasonally Adjusted Index 255.4

Week Ago 256.5 Year Ago 235.3

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **Programs encouraging employee participation in politics** have aroused the interest of utilities, which are approaching the topic somewhat cautiously. Focal point is Detroit Edison's "Applied Citizenship Activity" **(p 52)** . . . Conventional sources of fuel will dominate the power generation scene through 1975. By 2000, however, A-power will achieve its majority, a Congressional group is told **(p 54)** . . . Niagara Mohawk and Rochester G&E have agreed to plan for coordinated construction and EHV interconnections with Power Authority of N. Y. State **(p 54).**

ENGINEERING ▶ **Reflectors are so many on Pacific G&E's new microwave equipment** that its operation over 96 path-miles resembles billiard cushion shots **(p 60)** . . . Gas turbine generators meet Orlando Utilities Commission's peaking needs, making capacity available quickly at $100 per kw **(p 62)** . . . Curves show flicker voltage limits **(p 64)** . . . In squeezing more capacity out of old sites, Commonwealth Ed replaces 5,700-kw dc LaSalle Street Substation with 160-Mva one for ac network **(p 65).**

PROCUREMENT & PRODUCTS ▶ **Buyers hope to hold to an orderly but steady pace** in rebuilding inventories . . . Connecticut L&P nets 50¢ a cubic yard for its top grade fly ash . . . Read about storekeepers "smorgasbord" on **page 90.**

Politics and Public Power

THE GOP ON POWER . . . FOR 1960

The Republican Party has just stated its policy for the future on power development. In a phrase, it's this: Play down the role of federal government in a three-fold power expansion that is needed by 1976.

Power as a political issue looks, at this distance, to be as lively in 1960 as ever. It is one issue—and there are not as many of these as there used to be—where a fairly clear line can be drawn between the major parties.

The Republican position is contained in a report published on Tuesday of this week by the Republican Committee on Program and Progress. This body, under over-all Chairmanship of Charles H. Percy of Chicago, president of Bell & Howell Co, was created last winter at the suggestion of President Eisenhower. It was told to take a look, not at where Republicans had stood in the past, but where they should stand in the future. It set its sights from now to 1976.

Consideration of power problems, and the accompanying development of the suggested GOP policy, fell to a task force headed by Gabriel S. Hauge, onetime Eisenhower economic adviser and now a New York bank executive. Hauge had a blue-ribbon force of top party figures from industry, finance, business, agriculture and labor. There were no electric utility delegates, however.

These are its recommendations:

- Nearly three times the present capacity of power generation will be required by 1976. Additional federal effort—that is, more than is now put forth—will be required only for multi-purpose hydro development.

Here, the GOP advisers strike a solid stance. The federal government, they say, can-

MANUFACTURERS ▸ **Electrical Manufacturers' sales in Canada in 1959** will have the third best year in history, with 1960 showing even more improvement, predicts G. L. Wilcox, president of Canadian Westinghouse, before the Canadian Electrical Manufacturers Assn's 15th annual meeting where he had just been installed president of the association (p 92).

NEW EQUIPMENT ▸ **A fuse link with a removable button head** is designed for use with all modern open and enclosed distribution fuse cutouts . . . Watt-hour meters for 120, 240, and 480-v polyphase operation are introduced in a new line featuring resistance to corrosion . . . Capacitor blocks are designed for use with 25-kvar units in open-type banks at transmission and distribution voltages (p 98).

MANAGEMENT ▸ **Will consumer credit boost the boom?** Consumers have shown increasing willingness recently to buy appliances, autos, and other durables on time. Of course, debt repayments are being made at a record level too. This should help a further rise in the sales of durable goods, with the effect of tight money still undetermined (p 103).

SELLING ▸ **Pole-top metering may solve the problems of overloaded wiring** and antiquated service entrances now plaguing the farmer (p 107).

not and should not be expected to do the job alone. Without resort to the phrase directly, they make a plea for the Eisenhower "partnership policy" which, to all practical effect, has been struck dead by a Democratic Congress.

This new GOP report calls it "the teamwork principle" and defines it as "a working relationship between federal and state governments, publicly-owned local utilities, and publicly-regulated private utilities." It defends the idea with the argument that, in the first five years of the Eisenhower Administration, it added almost twice as much capacity in the Northwest as in the last five years of the Truman Administration.

• As the ratio of hydro power to total power necessarily declines, the GOP paper holds, so should the federal activity.

It holds that the thermal power field should be left exclusively to private and local-public —that is, non-federal—enterprise.

The same goes for atomic power generation. On this, which will be one of the continuing sore points between Republicans and Democrats, the GOP takes this line: ". . . non-federal organizations can carry out most of the applied research and development required." This is, of course, in conflict with the line that holds the federal government should have a big A-power program.

Thus is drawn the line. What is the report worth in real political terms?

It doesn't formally bind anyone, but Vice President Nixon has given his endorsement. It constitutes an advance look at the broad, outline of the 1960 platform of the Republican party.

Dr Cornelius Cotter of Stanford University, Percy's staff director and coordinator, is staying an extra year with the National GOP Committee for the specific purpose of advising on that 1960 platform.

Nuclear Notes

First series of operating tests are being conducted by APDA at the Fermi Nuclear Power Plant near Monroe, Mich. Being done without the presence of radioactivity, they are to prove the design and operating characteristics of the fast breeder reactor and to train plant operating personnel. The entire series of tests will take about a year to complete.

AEC will not go ahead with the 150-Mw core for Shippingport unless Duquesne boosts generating facilities from 100 Mw to 175 Mw to use heat from the proposed new core, John A McCone, chairman of AEC, recently told **Nucleonics** magazine.

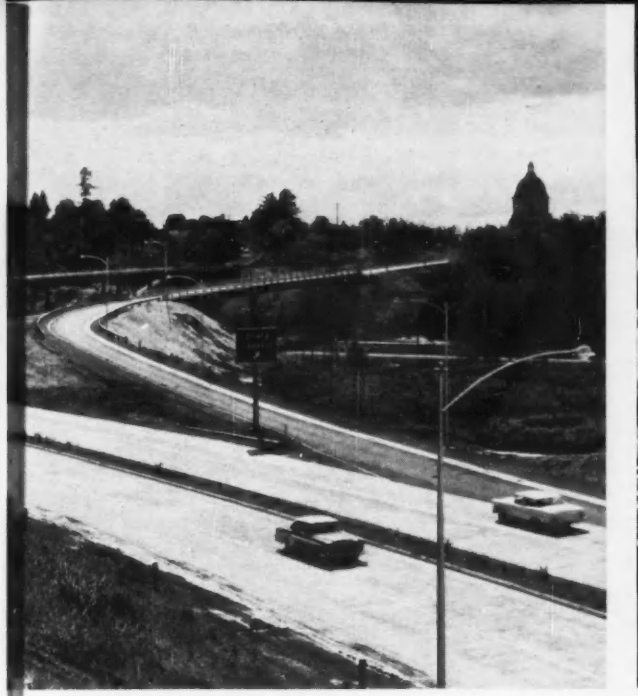
About 45 co-op and public power organizations have shown interest in participating in AEC's small pressurized-water nuclear power plant. The commission has extended the deadline to Dec. 16 to give interested groups more time to prepare proposals. Previous deadline was Nov. 16.

Two more British nuclear consortia have merged. General Electric Co Ltd-Simon-Carves group and Atomic Power Construction Ltd will collaborate in all future activities in the nuclear field. They will submit a joint bid for the Dungeness station and all future stations in the British program. Consolidations in the British industry, which began with an agreement between AEI-John Thompson and the Nuclear Power Plant Co, grew out of a recession in the nuclear industry brought about by the European coal surplus.

Westinghouse will double the capacity of its reactor evaluation center near Waltz Mill, Pa., which went into operation in Dec. 1957. Function of the center remains unchanged but it will be able to accommodate the largest forseeable reactor cores.

AEC plans to license Allis-Chalmers Mfg Co to operate its critical experiment facilities at Greendale, Wisc. to obtain data needed to design a power reactor being built for Northern States Power Co. Construction of the heterogeneous water-moderated unpressurized facility began at Greendale late last year. It will operate at power levels below 100 watts.

Labor troubles have suspended work on the 300-Mw Hunterston Nuclear Power Station in Scotland. The principal subcontractor, Motherwell Bridge and Engineering Co, warned last March that it would seek relief from the contract if wildcat strikes did not end. When they continued, the company suspended operations "until the way appears open to reassure on satisfactory conditions."



INSTALLATION of Line Material Uni-Ballast systems provides power for the Ovalite mercury vapor luminaires at the two largest interchanges on the Olympia Freeway.

NIGHT VIEW of a most important interchange, this "off ramp" provides direct access to the Capitol, Olympia, Wash. Ample light makes these interchanges safe for night traffic.

L-M Lighting Provides Economical Solution on New Olympia Freeway

Cost of original equipment plus installation and operating economies were prime considerations in choosing L-M's exclusive Uni-Ballast(TM) series system and L-M Ovalite(TM) mercury vapor luminaires.

The newly constructed and recently opened Olympia Freeway provides a beautiful, safe artery for traffic flowing to and from the Capitol Building at Olympia, Washington. In addition, a five-mile section of primary State Highway No. 9 has also been opened to traffic. Both are built to modern freeway standards and since they are primarily in-town highways, many interchanges have been provided.

Chose L-M "Ovalite" . . . These modern thruways have been made as beautiful and safe at night as they are by day, through well-designed, well-located highway lighting. All interchanges have high-intensity lighting to assure the utmost in safety. Fill-in lighting is used in all areas where ramp connections are within 600 feet of each other. The Washington State Highway Department chose L-M horizontal-burning Ovalite mercury vapor luminaires mounted on spun-aluminum poles for this most essential lighting.

Series System at Interchanges . . . At two of the largest interchanges, the Freeway tie-in to the Capitol Building and the junction of the Freeway and Highway No. 9, the problem of supplying power to individual light standards was encountered. Because of the distances involved, a series power supply proved to be the only practical way to keep copper sizes down, and keep costs within reasonable limits.

"Uni-Ballast" System Cuts Costs . . . After careful analysis of both installation and operating economies of all available series lighting equipment, the Highway Department decided upon Line Material's exclusive Uni-Ballast system. The Uni-Ballast system is a constant current series system designed by L-M for mercury vapor lamps. This system completely eliminates the necessity of individual ballasts at each luminaire, allowing substantial savings.

L-M Lighting Application Engineering . . . The lighting of these modern expressways is typical of the many installations of L-M lighting equipment. With a complete line of outdoor lighting equipment and a qualified staff of Lighting Engineers anxious to work with you, Line Material can help you arrive at economical solutions of most of your lighting problems.

Get Complete Information . . . For complete information on the L-M Ovalite, the exclusive Uni-Ballast system, or all L-M outdoor lighting equipment ask your L-M Field Engineer or Lighting Engineer; or write Line Material Industries, Outdoor Lighting Division, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Division of McGraw-Edison Company (Canada), Limited, Toronto 13, Ontario. 417

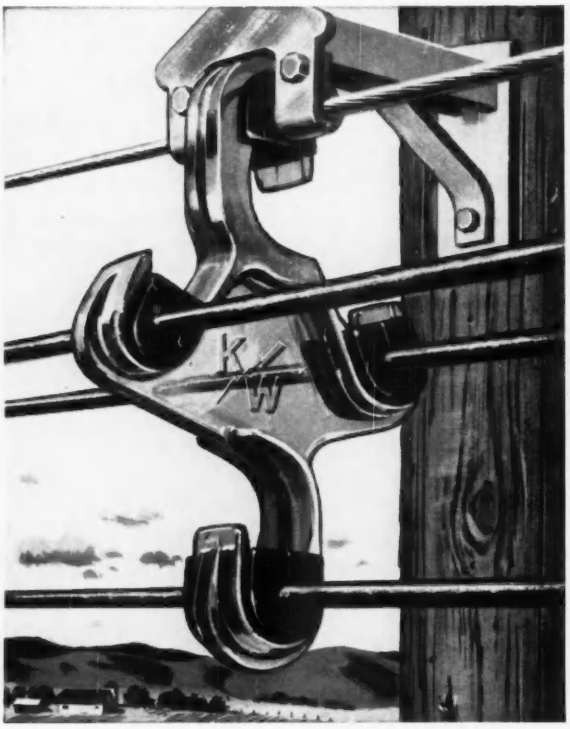
LINE MATERIAL® Industries Outdoor Lighting

McGRAW-EDISON COMPANY

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW-EDISON

NEW K/W SPACER TYPE AERIAL ADDS STRENGTH, CUTS COSTS,



One-Piece Design—Supports 1200 Pounds

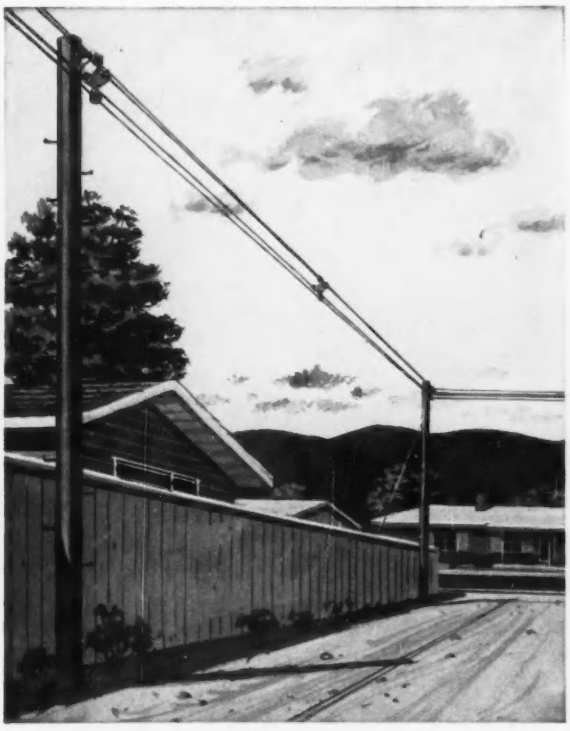
New solid spacer design has no loose parts nor movable pieces . . . it's simple, reliable and strong. Can support a minimum distributed load of 1200 pounds. Easy to install, since only one conductor is handled at a time. Snap-in grommets shaped to ease installation. Can be used with or without crossarms; standard hardware available from many suppliers.

Cuts Material Costs and Tree Trimming

A KW Spacer Cable system can be installed for as little as one half the cost of standard pre-assembled aerial cable!

Compared to open-wire weatherproof, the reduced tree trimming and improved system dependability resulting from messenger supported cables can justify the spacer system's slight additional cost.

CABLE SYSTEM IMPROVES APPEARANCE



Reduced Spacing Improves Appearance

Compared to open wire, closely spaced conductors present a neat, compact arrangement that improves appearance wherever it is installed. Close 6-inch spacing also improves system electrical characteristics . . . permits easy phase identification and proper load balancing. Usual installation practice is approximately 35 spacers per 1000 feet.

WITH its unique new spacer design, KW now offers you unsurpassed dependability and handling ease for cable systems operating at 5 to 15 kv, by using only one spacer for the whole range of voltages.

No tools or tightening necessary: entire spacer system snaps in and locks.

The system consists of four parts: (1) Phase conductors (EC grade aluminum, minimum conductivity 62 per cent, insulated with Polyethylene or Butyl rubber with Neoprene jacket); (2) Special high-strength messenger; (3) Molded one-piece spacers; (4) Molded Neoprene cable-retaining grommets.

Standard hardware is available from leading suppliers. Call your Kaiser Aluminum sales office or KW distributor for immediate service and full information.

Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

KAISER ALUMINUM

"IF IT CARRIES CURRENT, KW CARRIES IT!"

See "MAVERICK" • Sunday Evenings, ABC-TV Network • Consult your local TV listing.

DOW | HERBICIDES

Save money, time and trouble..

Off-season, basal application of Esteron® 245 O.S. is the safe, efficient, economical way to get lasting control of troublesome vegetation along right-of-ways. This rapid kill, chemical vegetation control helps utilities keep a clear line to customers . . . keeps the way clear for inspectors and repair men.

Applying a direct spray of Esteron 245 O.S. to the base area of vegetation gives prolonged control of brush, upland hardwoods, and so-called problem species, including ash. This basal method of application is especially desirable along distribution lines adjacent to public roads and highways. It eliminates the sometimes objectionable and unsightly

spray during the off-season with

. . . Esteron 245 O. S.

"browning" caused by foliage sprays.

Control of brush and weeds during an off-season is particularly safe. There are no growing crops to damage. And, application costs are lower when your spraying contractor isn't rushed. You are assured of better vegetation control in a shorter time . . . and at a saving.

Whenever . . . wherever you're faced with unwanted vegetation, you can depend on Dow brush and weed killers. For detailed information on low cost Esteron 245 O.S. or any of the other Dow vegetation control chemicals, write to: THE DOW CHEMICAL COMPANY, Industrial Section, Agricultural Chemicals Sales Dept. 204BA10-19, Midland, Michigan.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

Get 66% return with Standard Distri

50 KVA — 2400 V. — NO TAPS															
CONVENTIONAL 50 KVA								STANDARD 50 KVA SWA							
LOAD KVA	CORE LOSS	COPPER LOSS	TOTAL LOSS	% REG. 0.9 PF	%IZ	%IR	%IX	LOAD KVA	CORE LOSS	COPPER LOSS	TOTAL LOSS	% REG. 0.9 PF	%IZ	%IR	%IX
5								5							
10	170	23	193	.36	.42	.23	.35	10	170	17	187	.25	.25	.17	.22
20	"	92	262	.73	.84	.46	.76	20	"	67	237	.50	.56	.34	.45
25	"	144	314	.91	1.06	.58	.88	25	"	105	275	.62	.70	.42	.56
30	"	207	377	1.09	1.26	.69	1.06	30	"	150	325	.75	.84	.50	.67
40	"	367	537	1.45	1.68	.92	1.41	40	"	267	437	1.00	1.12	.67	.90
50	"	575	745	1.82	2.1	1.15	1.76	50	"	418	588	1.24	1.4	.83	1.12
60	"	828	998	2.18	2.52	1.38	2.11	60	"	602	772	1.49	1.68	1.01	1.35
70	"	1125	1295	2.54	2.94	1.61	2.46	70	"	820	990	1.74	1.96	1.17	1.57
75	"	1295	1465	2.72	3.16	1.73	2.64	75	"	940	1110	1.86	2.09	1.25	1.68
80	"	1470	1640	2.90	3.37	1.84	2.82	80	"	1070	1240	1.99	2.25	1.34	1.80
90	"	1865	2035	3.26	3.78	2.07	3.16	90	"	1355	1525	2.24	2.52	1.51	2.02
100	"	2300	2470	3.63	4.21	2.3	3.52	100	"	1675	1845	2.48	2.80	1.68	2.24
110	"	2770	2940	4.00	4.63	2.53	3.87	110	"	2020	2190	2.73	3.06	1.84	2.46
120	"	3300	3470	4.35	5.06	2.76	4.22	120	"	2400	2570	2.98	3.35	2.0	2.69

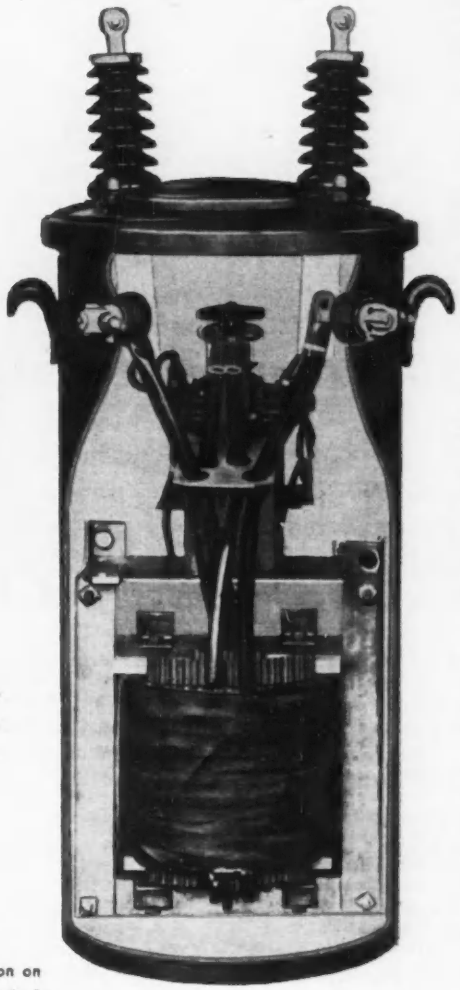
If you'd like a set of comparison charts like this on THE COMPLETE LINE of Standard SWA Distribution Transformers, drop a note to Standard. We'll send them by return mail.

Most utilities can only handle a maximum of 3% regulation without trouble. The Standard Transformer SWA units make this possible. These dramatic units slash copper losses 30%; provide lower impedance; give low temperature rise without excessive voltage drops; and produce savings sufficient to pay for the transformers!

Check the table above and then write for a complete set. Prove to yourself what the Standard SWA can do on your system.

n on investment
i bution Transformers

WRITE FOR Standard Bulletin S-401-C. It gives basic facts on the dramatic, new, SWA Series.



BUSHINGS — Wet-process for high strength. Designed to prevent surge flashover inside tank. High voltage bushings are corona-free at normal voltages. Raised mounting bosses shed water.

COVER—Liberal opening in hand-hole. Stainless steel clamping band with reusable nitrile rubber gaskets. Tapered cover sheds water easily.

TAP CHANGER — Easy-to-reach grip above oil. Spring loaded switch assures positive positioning.

POSIT-LOCK TERMINALS — Keyed to porcelain and porcelain keyed to tank to prevent turning. Receive either aluminum or copper conductors. Meet all new NEMA standards.

COIL—Precision wound with Formvar wire. Insulation exceeds all NEMA requirements. Lo-Temp design assures overload capacity at no extra cost. Coils braced to withstand external short circuit.

CORE-COIL ASSEMBLY—Core clamp frame keyed to tank bottom to prevent shifting.

WOUND CORE — Cold rolled grain-oriented silicon steel. Design produces reduction in exciting current, tank size and weight.

OIL—High dielectric strength. Inhibited or regular as required by the user.

FINISH—Primer and two finish coats. Salt spray tested. Outstanding durability under the most severe operating conditions.

TANK—Corrosive parts reduced to a minimum. Tested and fabricated in accordance with NEMA standards.

40 years of concentration on transformer design exclusively

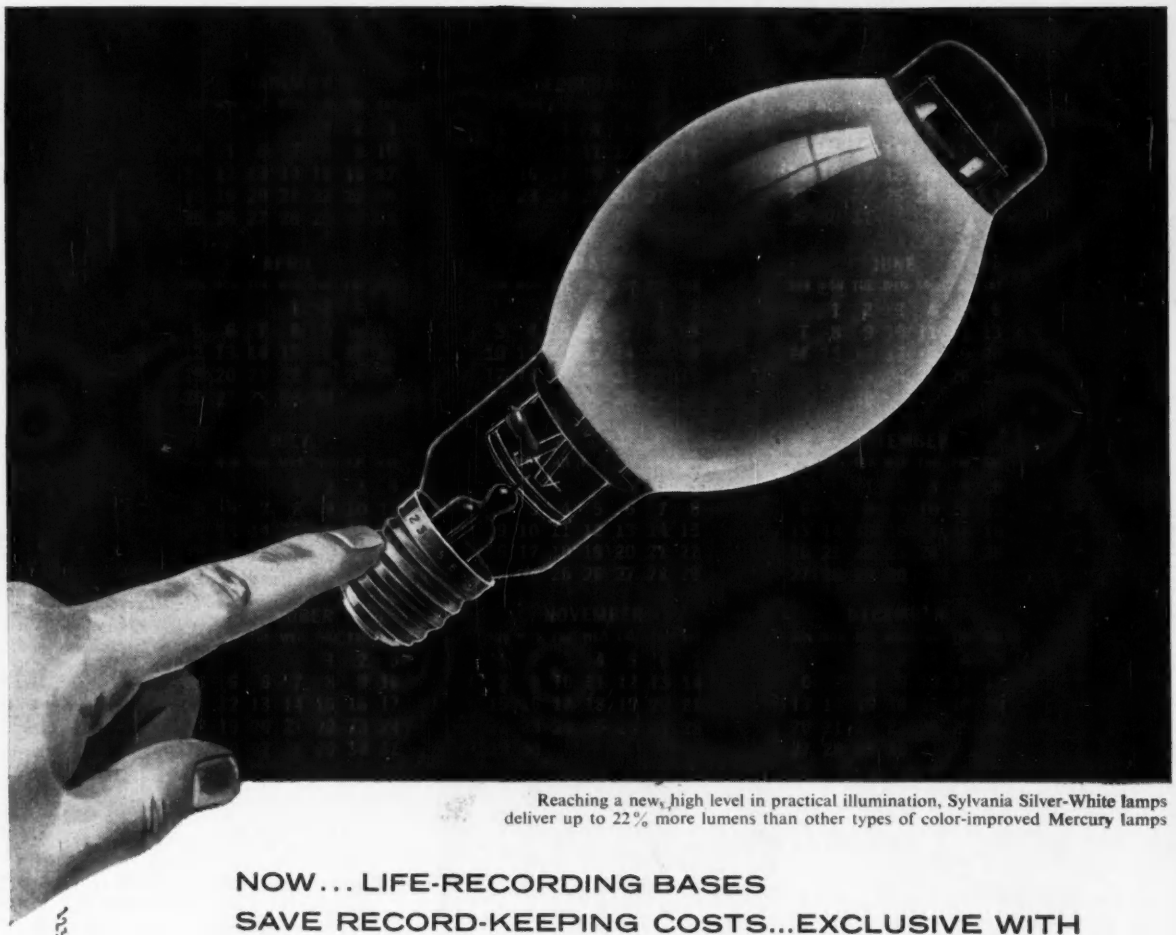
Phone Warren 2-1563

Standard Transformer CO.

WARREN, OHIO

"WHEREVER THERE IS POWER"

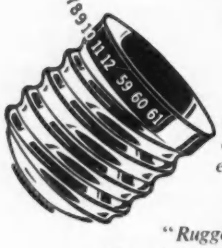
REPRESENTATIVES IN PRINCIPAL CITIES



Reaching a new, high level in practical illumination, Sylvania Silver-White lamps deliver up to 22% more lumens than other types of color-improved Mercury lamps

NOW... LIFE-RECORDING BASES SAVE RECORD-KEEPING COSTS...EXCLUSIVE WITH

Sylvania *Ruggedized* Mercury Lamps



A scratch of a simple tool, such as a screwdriver, easily records the month and year when a Sylvania "Ruggedized" Mercury Lamp is installed. This simple built-in record-keeper eliminates expensive records and time... is an instant aid in figuring installation costs accurately.

The recording base, however, is but only one reason to consider Sylvania "Ruggedized" Mercury Lamps for all of your highway, street lighting needs as well as high-bay industrial installations.

For example, Sylvania "Ruggedized" Mercury Lamps right now provide users across the country with all these important, *exclusive*, cost-reducing benefits:

Increased lumen output. Recent phosphor improvements boost the Silver-White Phosphor-Coated SH-1 lamp from 23,000 lumens in 400 watts to 25,000 lumens—the most efficient commercial mercury lamp (62.5 lumens per watt) available today.

9000 hours average usable life. You get the equivalent of two years' street lighting service. Built for long life and high lumen maintenance, these lamps have increased from 7000 to 9000 usable hours.

Ruggedized glass (PYREX brand bulbs) protects against moisture and condensation, moisture-laden or humid atmospheres, thermal shock.

Ruggedized construction throughout. Arc tube supports are specifically designed to resist and protect the lamp from destructive shocks and vibrations.

Guaranteed performance. Free exchange on any lamps which burn out during the first 1000 hours.

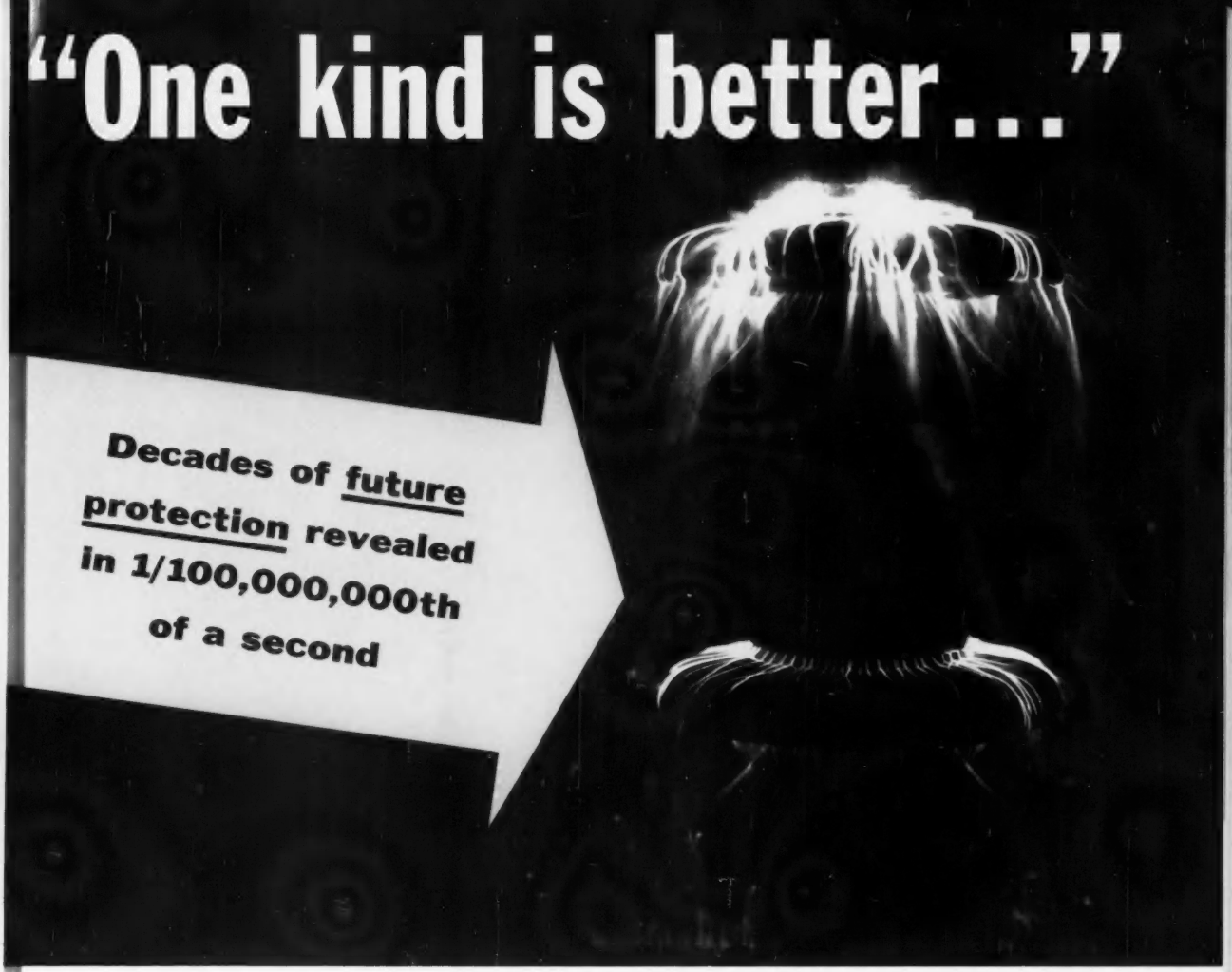
A complete line of Ruggedized Lamps covers a range of 400-, 425-, 700- and 1000-watt sizes . . . Silver-White (*Kolor-Keyed*), Clear and Color-Improved types . . . 25,000 to 62,000 lumens output.

Let Sylvania's staff of lighting engineers help evaluate your present and future lighting requirements, without obligation. For information or literature, call your Sylvania representative or write:

SYLVANIA LIGHTING PRODUCTS
Dept. 9L-7610, 60 Boston St., Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd.
P. O. Box 1190, Station "O," Montreal 9

SYLVANIA GENERAL SYSTEM
Subsidiary of
GENERAL TELEPHONE & ELECTRONICS

"One kind is better..."



A strange-looking phenomenon - - even to most insulator manufacturers!

Unconventional, and highly uncommon laboratory techniques permit study of O-B switch insulator stacks under critical pre-flashover electrical stress. The condition illustrated exists one hundred-millionth of a second before lightning flashover - - that tiny morsel of time in which insulators live or die.

Studies such as this permit us to evaluate the intricate behavior of insulators. It permits us to say in all honesty, "One insulator is better than another." And the reasons why are clearly shown.

When you purchase switchgear or "packaged" substations on the open market, you have free choice of insulators. Isn't it wise to protect the future by taking just a minute to write "O-B insulation" on these orders? Name it, and you can have it!

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass (B) HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

4934-H

ThorexA
Same high-performance Dynagap element used in all classes and voltage ratings.
Up-grades protection of lighter-duty types.
Drastically reduces size of station models.

Arresters break the "class barrier"!

Revolutionary Dynagap Element Interchangeable In All Voltage Ratings From 1 to 345 kv

Entirely new in the lightning arrester art is a protective element interchangeable in all grades and all voltage ratings. This is the Dynagap!

Adaptable to a new miniaturized line of Distribution Class arresters, this same element imparts drastic size reduction when applied to heavier-duty types. Station Class Thorex arresters are now no larger than insulator stacks - - one-third the height of former types, a fraction of the weight, and devoid of unit connections by virtue of continuous porcelain housings. This provides a practical remedy to contamination problems.

Distribution and Intermediate Class Thorex arresters enjoy the unheard-of advantage of sharing the same high-performance elements as used in models for service up to 345 kv.

Before your next lightning arrester requirements are placed - - Distribution, Intermediate, or Station Class - - give Thorex your most critical examination. From any standpoint, including cost, it is today's distinct choice.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS • LINE HARDWARE • CAPACITORS • LIGHTNING ARRESTERS
BUSHINGS • HOLAN TRUCK-MOUNTED POWER DEVICES AND BODIES • BRONZE VALVES

How to keep a spring springy

Nothing could happen to anything as beefed-up as these compression springs used in O-B bushing assembly. Nothing . . . ? They are electrically in parallel with a copper conductor and a bronze reservoir. Most of the current can by-pass them, but *not all of it*. Being ferrous material they are subjected to hysteresis and eddy currents. These cause heat. And heat can cause slow annealment.

We might "get by" if we ignored this, but getting-by is not the fundamental of O-B bushing construction. Instead, we insulate the bottom of the reservoir and make the conductor the only live element. The springs are electrically dead as load current carrying members.

This is done by a simple insulating sleeve that prevents contact between the reservoir base and the conductor. It doesn't cost much -- until you figure how much it costs, sometimes, to learn your business.

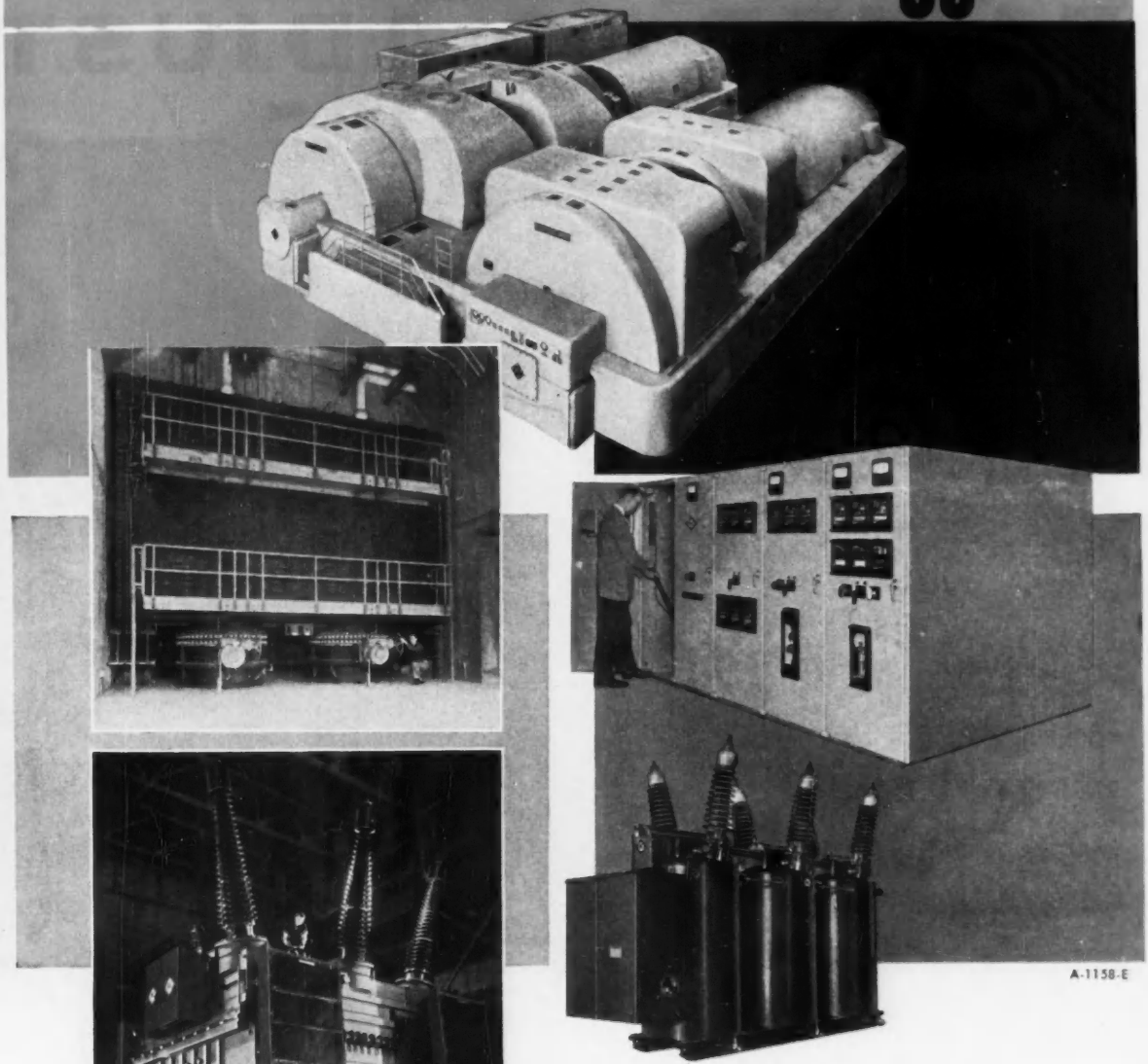
If you like the feeling of assurance that comes with details that are understood and worked-out, this is easy to get simply by saying "O-B bushings" when you order new station apparatus.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass HOLAN

PORCELAIN INSULATORS · LINE HARDWARE · CAPACITORS · LIGHTNING ARRESTERS
BUSHINGS · HOLAN TRUCK MOUNTED POWER DEVICES AND BODIES · BRONZE VALVES

ALLIS-CHALMERS modern line for '59



A-1158-E

Modernize

to build system efficiency

A continuing program of electrical equipment modernization is one of the most successful approaches to cost reduction. The *degree* of cost reduction depends upon unit efficiency. Allis-Chalmers equipment has built a world-wide reputation for achieving *higher* system efficiencies created through research-born design advantages!

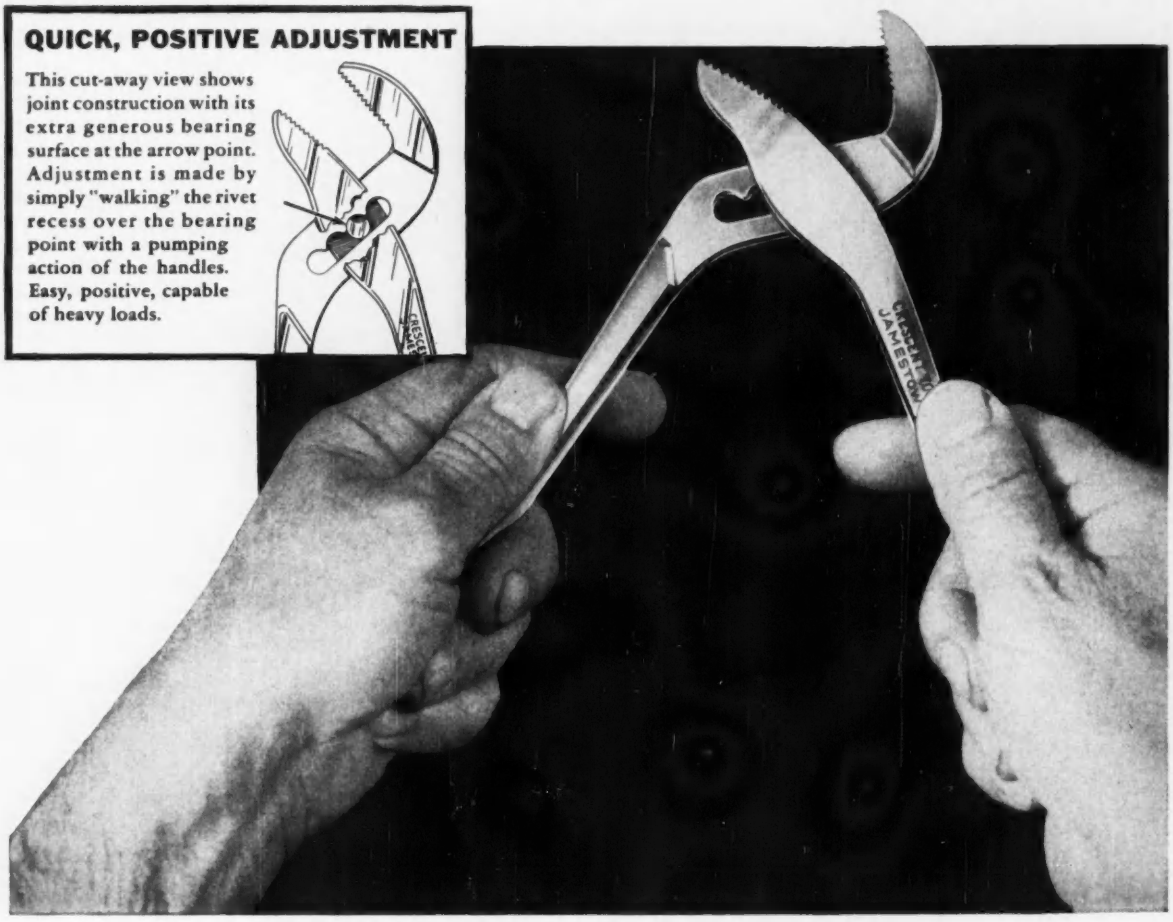
ALLIS-CHALMERS

For detailed information on Allis-Chalmers efficiency-boosting advantages, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Not only stronger and thinner . . . but
EASIER TO ADJUST

QUICK, POSITIVE ADJUSTMENT

This cut-away view shows joint construction with its extra generous bearing surface at the arrow point. Adjustment is made by simply "walking" the rivet recess over the bearing point with a pumping action of the handles. Easy, positive, capable of heavy loads.



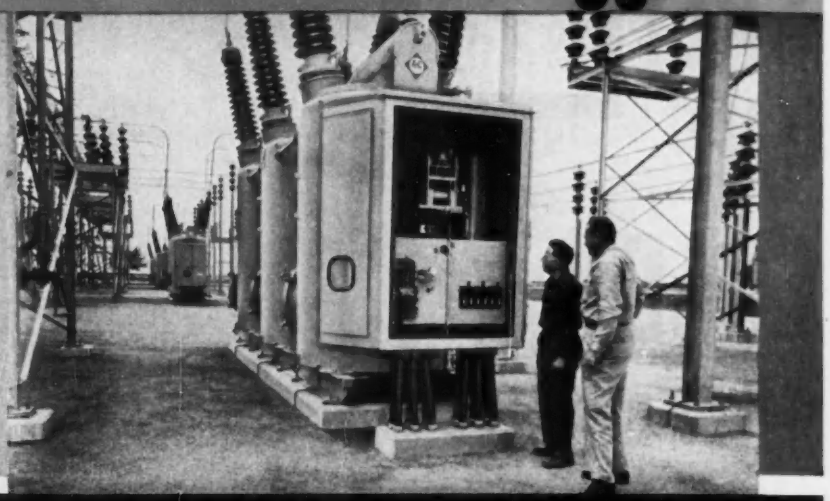
So easy that after a little practice it can be done with one hand. Yet once adjusted to any of its four positions, Crescent's P210 Utility Plier just won't slip under severe loads. Yes, here's a 12 ounce plier that performs like a pipe wrench . . . is *stronger* than any other Utility plier . . . *thinner* than any other Utility Plier . . . and retails for only $3.15.

No. P210 will grip flat, square, hex or round objects up to 1½". It measures 9½" overall and is finished in rust-resistant zinc plating.

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

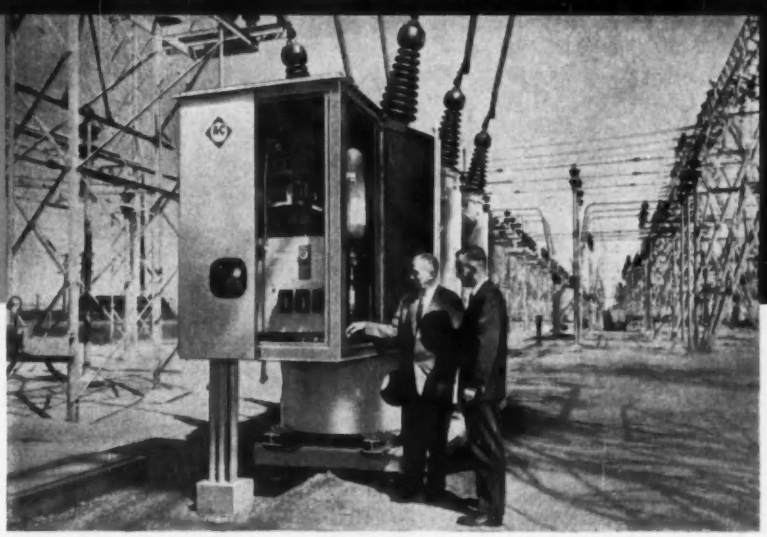
CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

ALLIS-CHALMERS modern line for '59



C. M. Ripple, plant superintendent, and L. O. Sharp, Jr., assistant plant superintendent at W. A. Parish power plant, shown with one of eight 138-kv Allis-Chalmers breakers in switchyard.

Look at the record at Houston Lighting & Power Company



H. C. Taylor, electrical supervisor Power Department, and A-C's J. O. Higgins in Deepwater power plant switchyard.

Ten Allis-Chalmers breakers with *Pneu-Draulic* operators have been in service nearly five years. Eight additional units installed a year ago bring to eighteen the total number in use by the company.

In fact, the excellent performance of Allis-Chalmers breakers with *Pneu-Draulic* operators has led to their use on over 100 power systems. Repeat orders have been received from more than 60.

Behind this story is design leadership in power circuit breakers. A-C has led the way to fully mechanically trip-free operation and high speed arc interruption, as well as simplified operator design as represented by the *Pneu-Draulic* operator.

Get details from your nearby A-C office, or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin

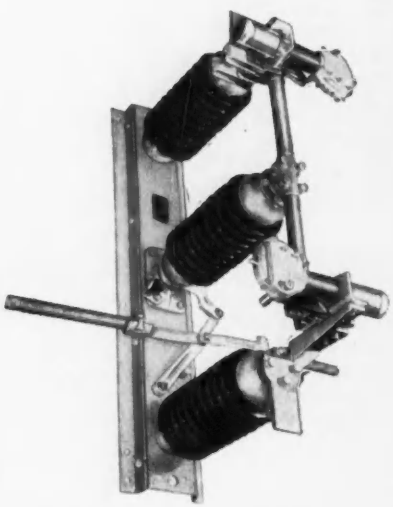
Pneu-Draulic is an Allis-Chalmers trademark.

A-1035-E

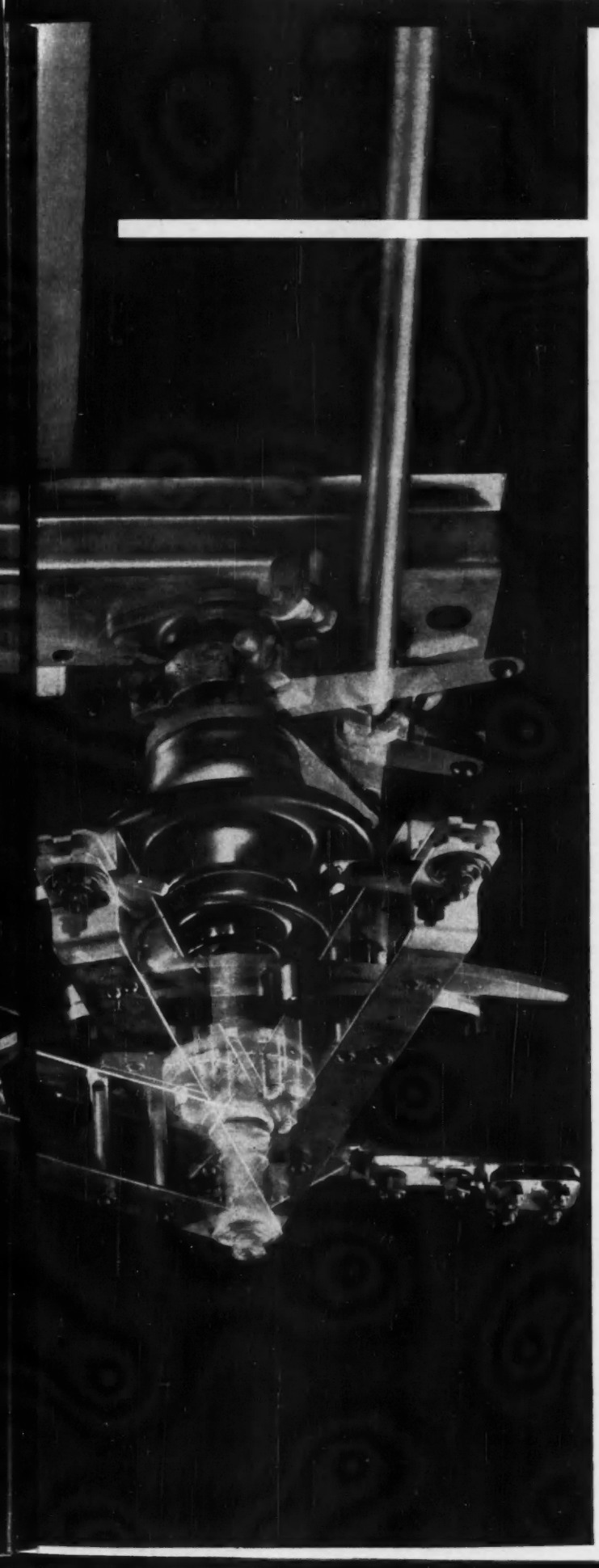
ALLIS-CHALMERS

SPLIT THE LOAD

(OR EVEN DUMP IT)



Double-Break Style, 34.5 kv rating (above) and Side-Break Style, 14.4 kv rating (right)



with S&C Load Interrupters that cost no more than disconnects

Now from S&C you can get load interrupters at the same price as disconnects. This means that you can handle any kind of line switching in the simplest way at the lowest possible cost.

Here are the devices that do it:

1. The Side-Break Alduti Load Interrupter at 7.2 kv and 14.4 kv, and
2. The Double-Break Alduti Load Interrupter at 23 kv and 34.5 kv.

Both give you load dumping* (full 600-ampere arc-free load switching at full line voltage) along with loop sectionalizing (switching currents in parallel or loop circuits) and line dropping (switching line charging currents).

Since these switching duties at today's voltages and loads can't be handled by disconnects, why not compare the cost of S&C Load Interrupters with disconnects. You'll find there's no premium price for premium performance.

Here are some of the other advantages of S&C Load Interrupters:

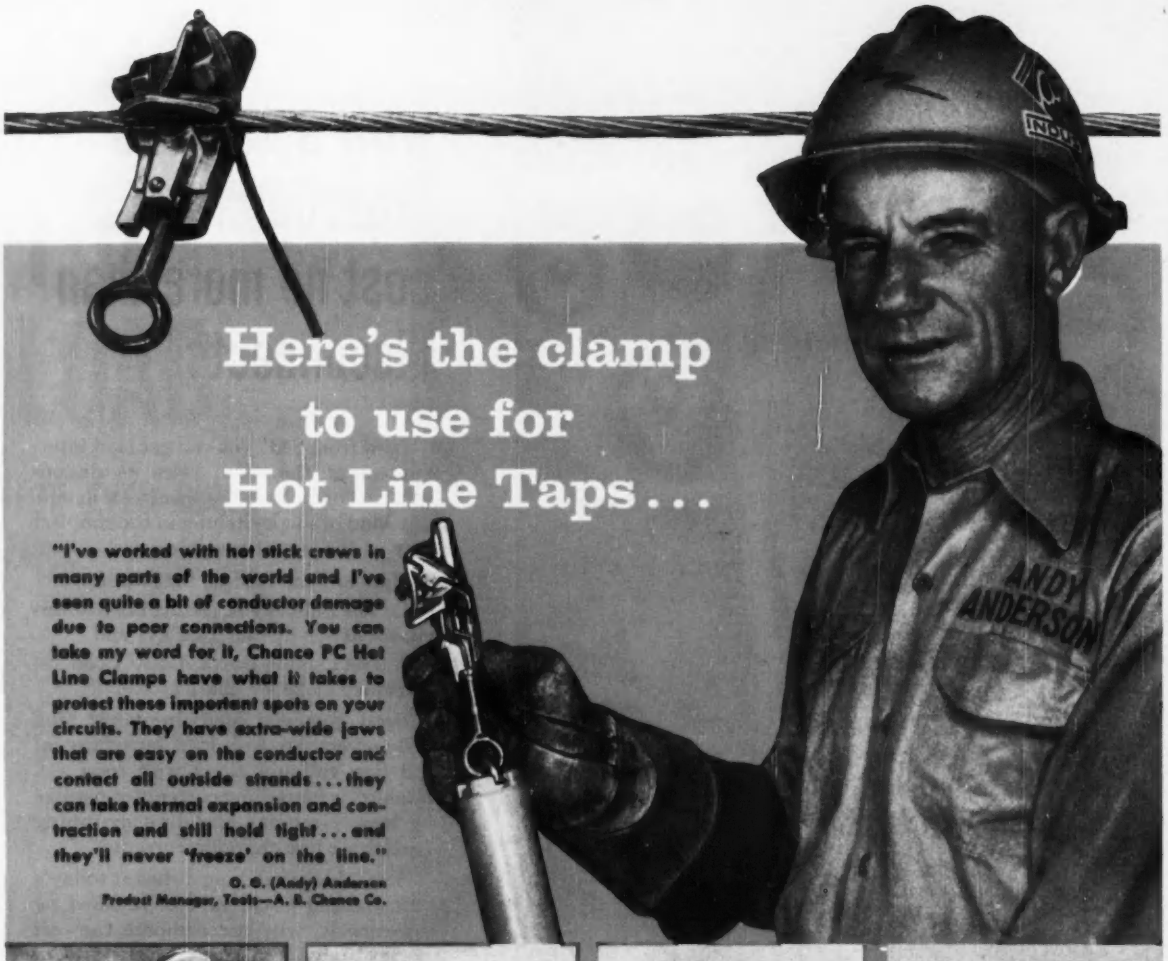
- 600-amp load switching without line or feeder breaker openings
- a maintenance-free interrupting device
- no external arc
- can be mounted in any position . . . vertical, upright or inverted.

For more information, please contact S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill.

* Important because: (1) Emergency situations (wires down, etc.) demand quick action, hence dumping the load. There is no time to set up communications for complicated breaker and switch sequencing. And (2) there's always the possibility of an operator error or misunderstanding, with the result that a loaded circuit may be dumped inadvertently.

S&C ELECTRIC COMPANY

S&C


Here's the clamp
to use for
Hot Line Taps...
"I've worked with hot stick crews in many parts of the world and I've seen quite a bit of conductor damage due to poor connections. You can take my word for it, Chance PC Hot Line Clamps have what it takes to protect these important spots on your circuits. They have extra-wide jaws that are easy on the conductor and contact all outside strands... they can take thermal expansion and contraction and still hold tight... and they'll never 'freeze' on the line."
O. O. (Andy) Anderson
Product Manager, Tools—A. B. Chance Co.
ANDY
ANDERSON
1
2
3
4

...and here's the way to get a lineman's cooperation in making trouble-free connections

Make it as easy as possible to apply clamps with **z.l.n. 100** by buying Chance clamps packaged with this *Contact Aid* pre-applied. Our engineering research and our experience with many utilities has taught us that Chance **z.l.n. 100** *Electrical Contact Aid* and a wire brush are the first requirements in making a long-lasting hot line tap. 1. Apply **z.l.n. 100** *Contact Aid* to the conductor cleaning brush. 2. Wire brush the contact area of the conductor to remove surface oxides and to apply the corrosion inhibiting *Contact Aid*. 3. Remove the plastic package from a Chance "Protected Connection" Clamp—(the *Contact Aid* is pre-applied to a factory-clean clamp). 4. Install the clamp—It's specially engineered for hot line taps that will let you give your customers continuous electrical service without danger of burn-downs and allow you to easily remove the service if necessary.

Chance "Protected Connection" Type PC Clamps are available in a complete range of sizes that can take from No. 6 ACSR to 1,431 MCM ACSR and comparable sizes of copper conductor. There's a type for every contact combination—including the Chance AGP with heavy fortified cadmium coating for additional protection on bimetal connections.

ABC INDUSTRIES

A. B. CHANCE COMPANY General Offices CENTRALIA, MISSOURI

CC59-4

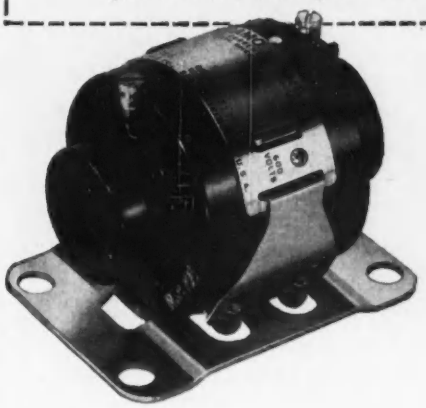
Developed to Meet Your Needs:

A Complete Line of CURRENT TRANSFORMERS to accurately measure loads from 20 to 1600 Amperes

Type BH Transformers

Single or Dual Range—Completely Color Coded

Sangamo Type BH (Big Hole) Transformers come in single range 200 to 800 ampere ratings and in the unique dual range 200/400 or 400/800 ampere ratings that reduce transformer changeouts. BH Transformers provide more cable space—more installation room—easier cable insertion. They are molded in colored epoxy resins of standard resistor colors to let you determine ampere rating at a glance—even when the units are mounted near the top of a pole. Request Bulletin 503.



Type R Transformers

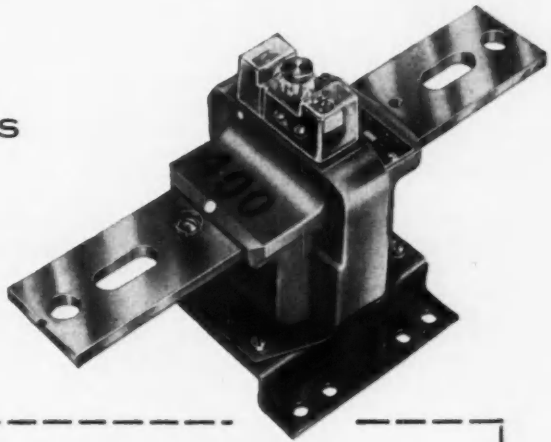
... for flexibility of application

Type R Transformers are light enough to be supported by the primary conductor alone, and are available in eight variations that give you unusual freedom in devising simple, cost-cutting installations for your system. See for yourself how these transformers can provide flexibility to meet growing needs. Request Bulletin 150 D.

New Type MV-6 Transformers

... for indoor installation

Here's a new wound-type current transformer that will reduce the cost of metering installations where more expensive weather-proof transformers are not required. The 400 ampere Type MV-6 meets the 0.3 A.S.A. Accuracy Classification for B-0.1 and B-0.2 burdens. Molded in epoxy resin. Bulletin 150D (1) gives full information.



SM59-6

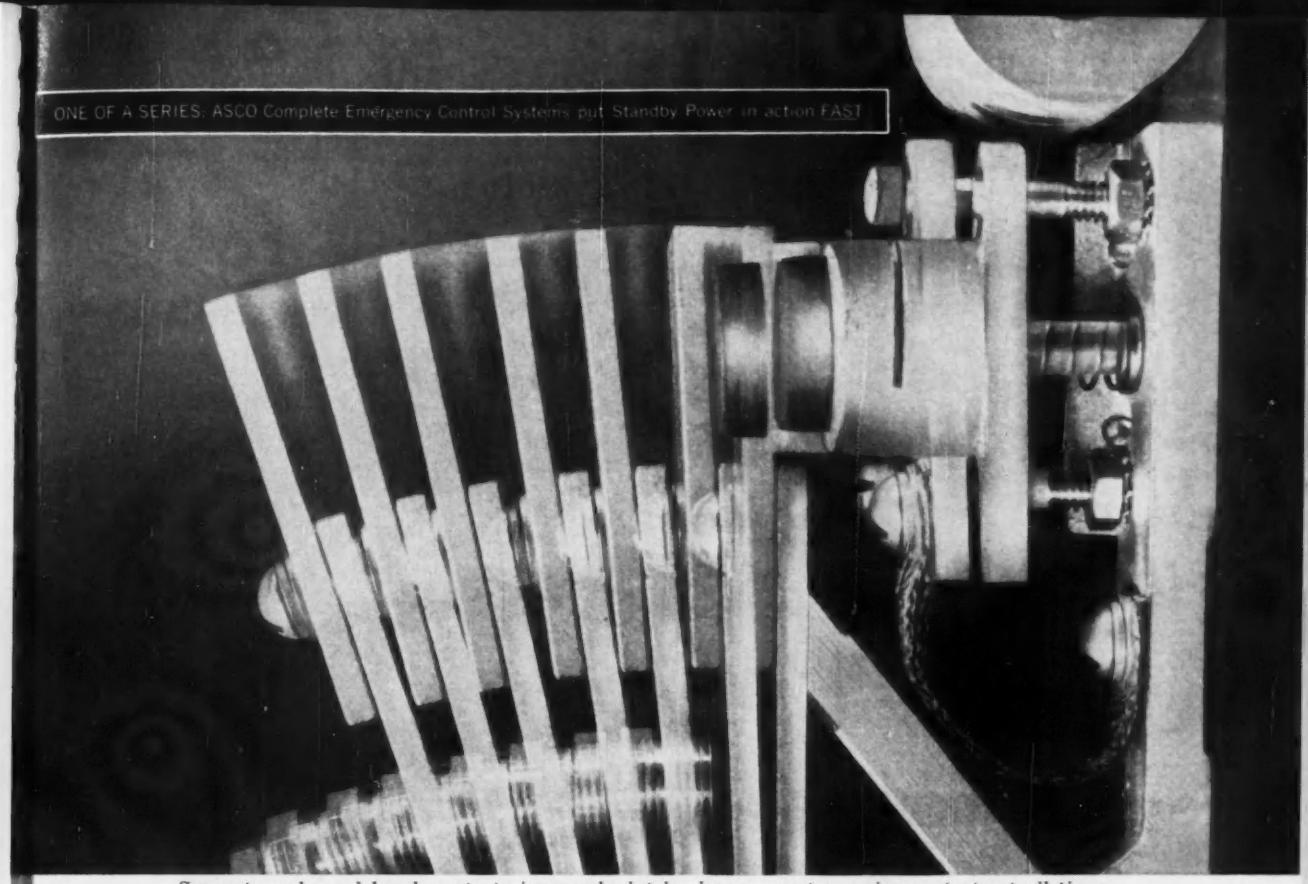
SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

The achievement of static-free, uninterrupted telephone service between continents is no longer a dream . . . it's now a reality. Buyers of electrical cable, keenly aware of the skill utilized in this task, are turning to the source for expert help in solving their own wire and cable problems. Simplex was selected as sole American manufacturer of the transatlantic and other major oceanic telephone cables on the basis of over seventy years' experience in producing quality products. Let the Simplex reputation for research, engineering and service be your unerring guide when selecting cable for all applications. **SIMPLEX WIRE & CABLE CO.**, Cambridge, Massachusetts and Newington, New Hampshire.

LIVE BETTER ELECTRICALLY

Simplex

Highest quality cables for: Mining • Power & Lighting • Construction • Transportation • Communications • Signalling



Separate make and break contacts insure absolutely clean current carrying contacts at all times.

ASCO Automatic Transfer Switches transfer load in 1/30 to 1/6 of a second

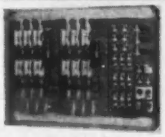
When a sustained outage is detected, a contact on the ASCO Automatic Transfer Switch closes in 1/50th of a second. When standby power source attains proper voltage and frequency, the switch transfers the load to the electric plant. *Time of transfer—1/30th to 1/6th of a second—up to 30 times faster than competitive switches!* This speed reflects the extra engineering quality built into every ASCO Transfer Switch. For example, rotating weight design locks contacts in position. They cannot be pulled, jarred, or shocked loose . . . perfect electrical contact and minimum power losses are assured. Powerful mechanical linkages with single coil design provide simple, sure, two-position operation. Unique interlocking makes it impossible for both normal and emergency contacts to be opened or closed at the same time . . . gives you added assurance that power will be available when you need it.

Dependable control by ASCO . . .

Automatic Switch Co.
50-P Hanover Road, Florham Park, N. J.
FRontier 7-4600

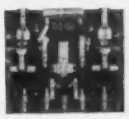
ASCO®

ASCO CONTROL SYSTEM COMPONENTS:

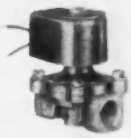


Automatic Transfer Switches *for all classes of load to 750 volts AC-DC. Transfer connected load to standby power when failure or substantial reduction occurs. Return load automatically when full power is restored – in sizes from 10 to 1200 amps. Write for Catalog 57-S1.*

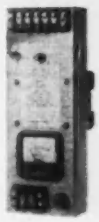
Automatic Engine Starting Controls *provide fully automatic starting and stopping of diesel or gas engine driven generating sets. Write for Catalog 57-S6.*



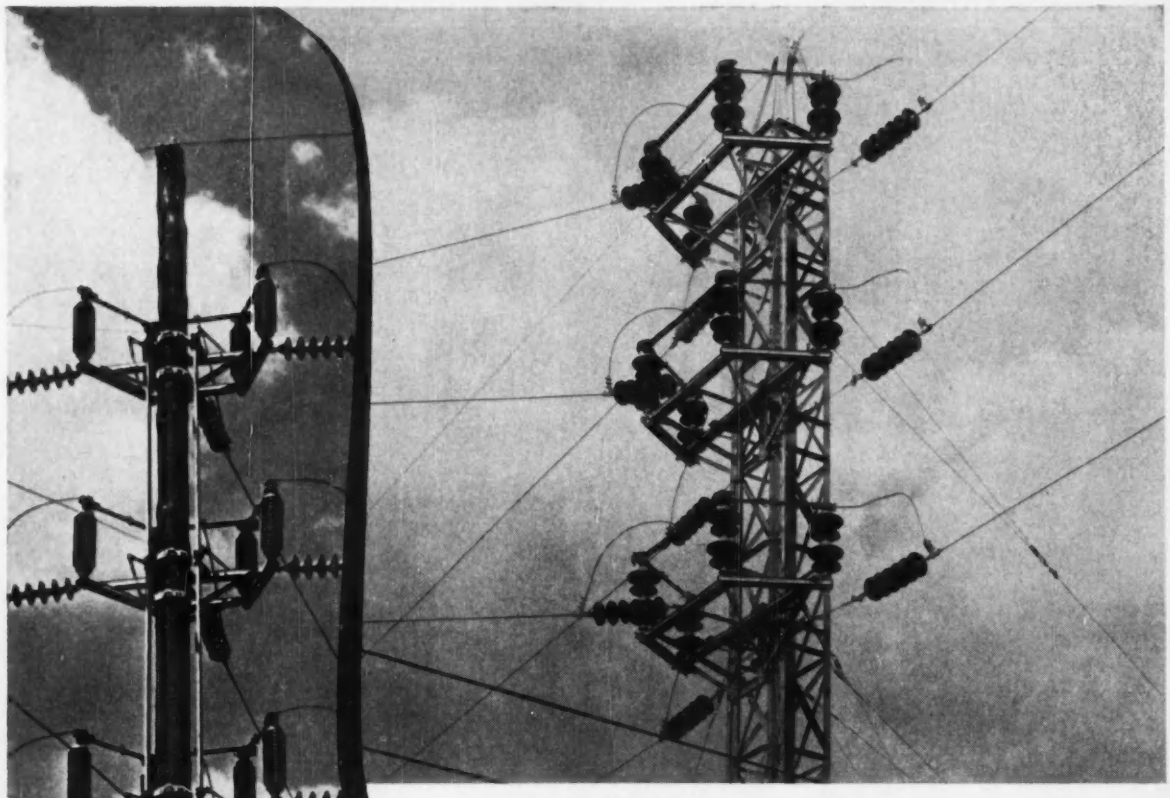
Load Demand Controls *automatically start engine when load is applied; stop it when load is removed. Write for Catalog 57-S6.*



Solenoid Valves *for air starting applications, and for controlling the flow of cooling water, fuel oil and other liquids and gases. Write for Catalog 25.*



Battery Chargers *are designed for heavy duty industrial use. Provide power to keep engine generator cranking batteries fully charged. Charger can be combined with automatic transfer panel for compact, single package arrangements. Write for Catalog 57-S6.*



EITHER WAY . . . THEY'RE UP TO STAY

TECO 2-Way, 69 KV switches for structural tower or pole installations

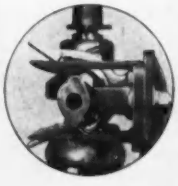
A TECO 2-Way, 69 KV switch will not only fit steel or aluminum tower mountings, but this same switch can be pole-mounted with bands — easily, quickly. Either way, you've got as nearly permanent an installation as is possible to have.

As with all TECO switches, rugged dependability, high-pressure beryllium contacts and an ultra-high speed arcing horns are outstanding features. You are assured of years of trouble-free performance.

Best of all, you pay no more for a TECO 2-Way than you would a regularly mounted switch.

As a further convenience, both the structural tower and switch can be furnished as a packaged unit.

OUTSTANDING FEATURES



High pressure wiping action of the beryllium contacts during coming gives new equipment conductivity even after years of service and under severe icing conditions. One-piece jaw contact eliminates corrosion between bolted areas.

Exclusive with TECO. Double arcing spring reduces current value at time of opening, thereby reducing ionization and accomplishing arc interruptions faster.

TECO 2-Way, 69 KV switches are available in 600 and 1200 ampere sizes. Write today for bulletin 101.

TURNER ELECTRIC CORPORATION

9510 ST. CLAIR AVENUE E. ST. LOUIS, ILLINOIS

Complete line of air-break switches, dead-end band brackets, flexi-band and thru-bolt cluster transformer brackets.

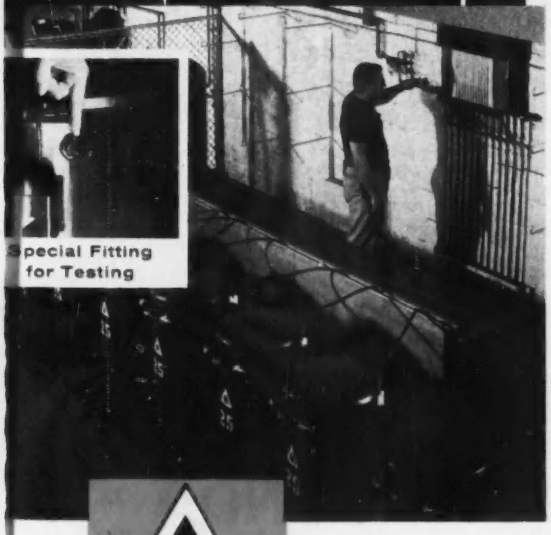
ewly-designed Uptegraff tank cover seal...

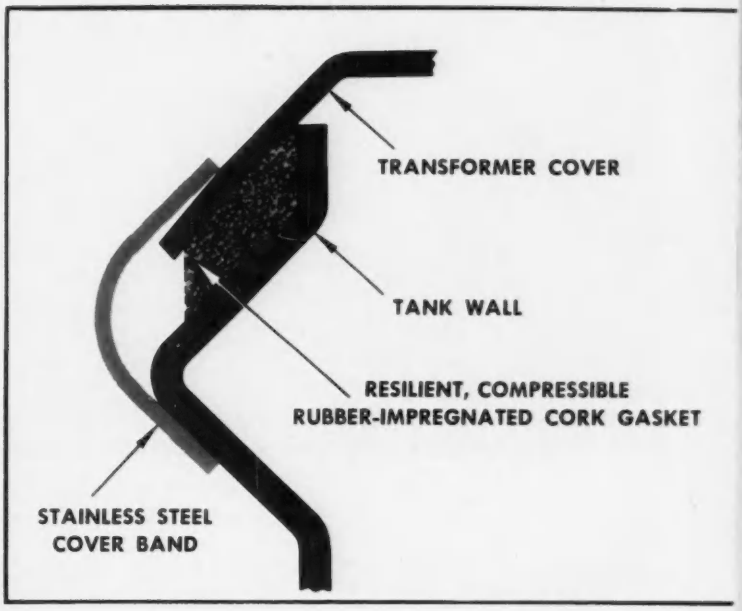
keeps out contamination...

extends service life

Banded cover insures uniform seal

A one-piece stainless steel band with bronze bolts and nuts grips the parallel surfaces of tank wall and cover **firmly** and compresses the cork-and-rubber gasket in a tight, positive seal, uniformly all around the tank. It's easy to tighten, remove and reinstall.





Deformable, Resilient, Compressible Gasket

This special diamond-shaped Buna N rubber-impregnated cork gasket is compressed to a limited and predetermined extent between the parallel surfaces of the tank wall and cover. Its elastic limit is not exceeded, so the gasket does not take a permanent set. Consequently, the cover can be removed and replaced repeatedly without affecting the effectiveness of the seal. Cemented to the tank wall on one side and surface silicone-grease treated on the cover side, it provides complete protection against the entrance of oxygen, moisture or any other contaminating influence.

Pressure Testing Proves Seal

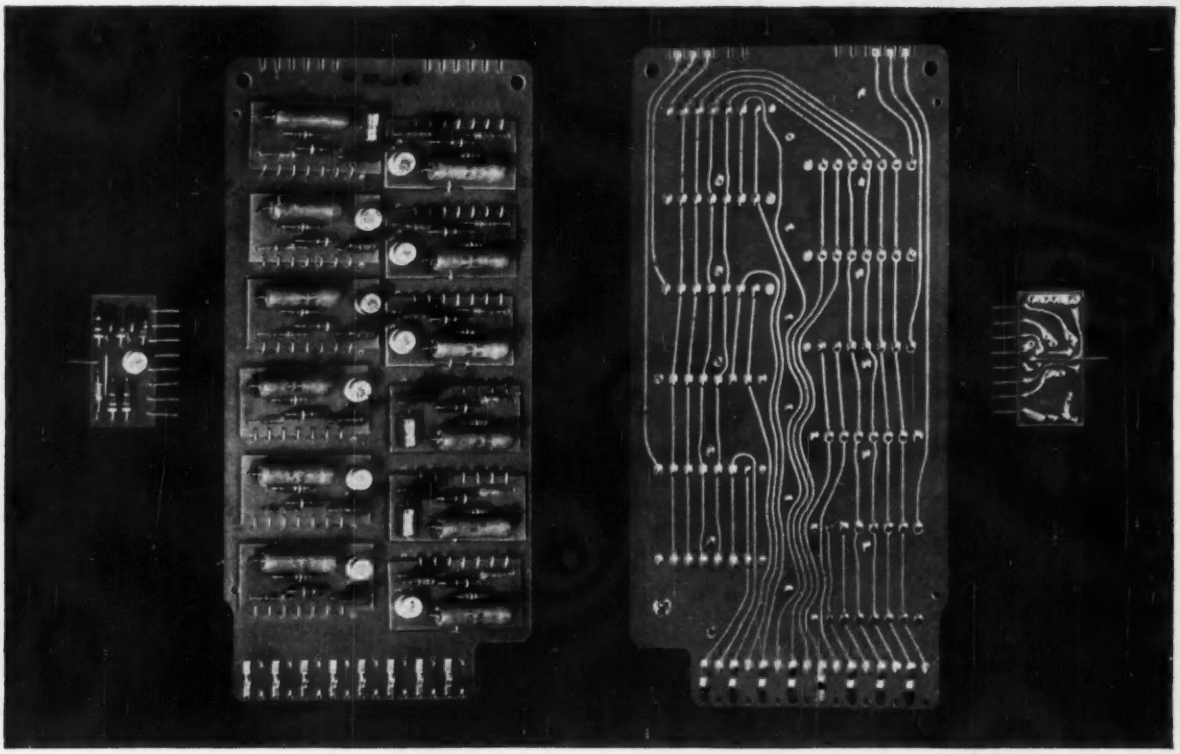
Each completed Uptegraff transformer is given a pressure test with dry air at 3 to 5 psi to prove the integrity of its seal. At this pressure, by means of pressure differential manometers, the slightest leak would be quickly detected. For this exclusive Uptegraff feature a special fitting is provided in the tank wall which is subsequently plugged.

Ask your Uptegraff Representative for details

U
TRANSFORMERS

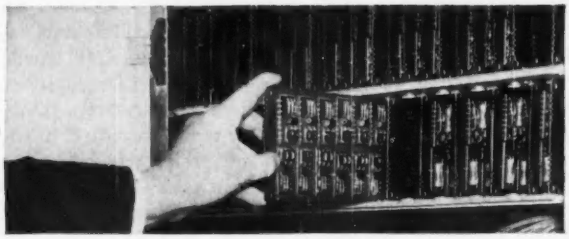
R. E. UPTEGRAFF MANUFACTURING CO.

Scottdale, Pennsylvania

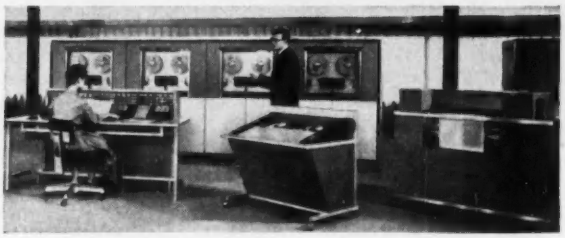


In the electronic logic elements of the RCA "501" data processing system, transistors and other small components are mounted on plastic wafers with printed-circuit wiring (small units right and left, above). The wafers, in turn, are mounted on thin plastic boards, also with printed circuits (center, above). This modular construction reduces size of the system by 75%, increases reliability, reduces maintenance.

PRINTED CIRCUITS OF COPPER AND ALL-TRANSISTOR DESIGN HELP MAKE 75% SIZE REDUCTION IN RCA DATA PROCESSOR



Modularized circuit elements are installed in the system by sliding them in place. Contacts on outside edge make possible quick checkout and testing without removing boards. Many thousands are used in each system.



The "501" is designed to handle paper work—bills, reports, payrolls, etc.—accurately, economically, and at extremely high speed. It serves businesses ranging from banks and utilities to steel mills.

With the growing importance of miniaturization and reliability in electronics and nucleonics, Anaconda electrical copper products take new and varied forms—find new and more sophisticated uses.

In the compact new all-transistor data processing system shown above, the printed circuits are etched from Anaconda "Electro-Sheet" copper foil. This is electrodeposited paper-thin copper with quality carefully controlled to meet NEMA specifications. Bright on one side, it has a matte finish on the other for a firm bond to the circuit board. "Electro-Sheet" is furnished in various thicknesses to exceptionally close tolerances.

In other fields, the growing need for compact electrical assemblies which can handle high current densities calls for hollow copper conductors for fluid cooling. And for new environmental conditions, more difficult application needs, there are new copper alloys.

METALLURGICAL ASSISTANCE. Whatever your problem in electrical conductors, Anaconda metallurgical specialists will gladly help you select the metal—and the form or shape—best suited to your needs. See your American Brass representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

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New RCA Transistorized "Low Drain" Mobile Unit
Greatest Value...in Performance...Service...Price

Looked at from any angle—performance, service, price—the new "LD" (Low battery Drain) 2-Way Radio is sensational news from the leader. Minimum tubes in the receiver, no vibrators in the power supply—they've been replaced by readily available stock transistors for long life and dependability! Transistors used only in circuits where long experience has proven they can give reliable performance. Your RCA representative will be glad to show you why the "LD"—dollar for dollar, feature for feature—is today's greatest 2-way radio value.

Heat drain reduces internal temperature of unit up to 40%, providing longer component life (case has wrap-around heat sink). Standby monitoring feature cuts battery drain to a mere 2¼ amps. With vehicle engine off, radio can be left on to receive incoming messages for long periods without impairing battery life—automotive cabling used exclusively for greater flexibility, positive contact, corrosion resistance. Five watts of audio power for greatest message intelligibility. Equipment easily moved from car-to-car—trunk or true-dash mount. Security sealed circuits clearly numbered to provide "road map" for fast, simple servicing—RCA Service Company technicians available to keep your equipment operating at maximum efficiency.

Mail coupon for further facts.

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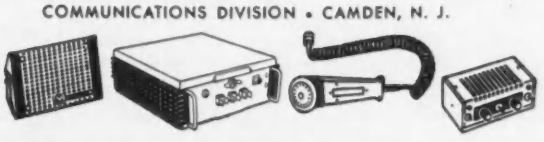

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☐ Please send me FREE literature on the new RCA Transistorized Mobile Radio

☐ Have RCA Communications Specialist contact me and explain why this is today's best value in 2-way radio

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COMPANY_____

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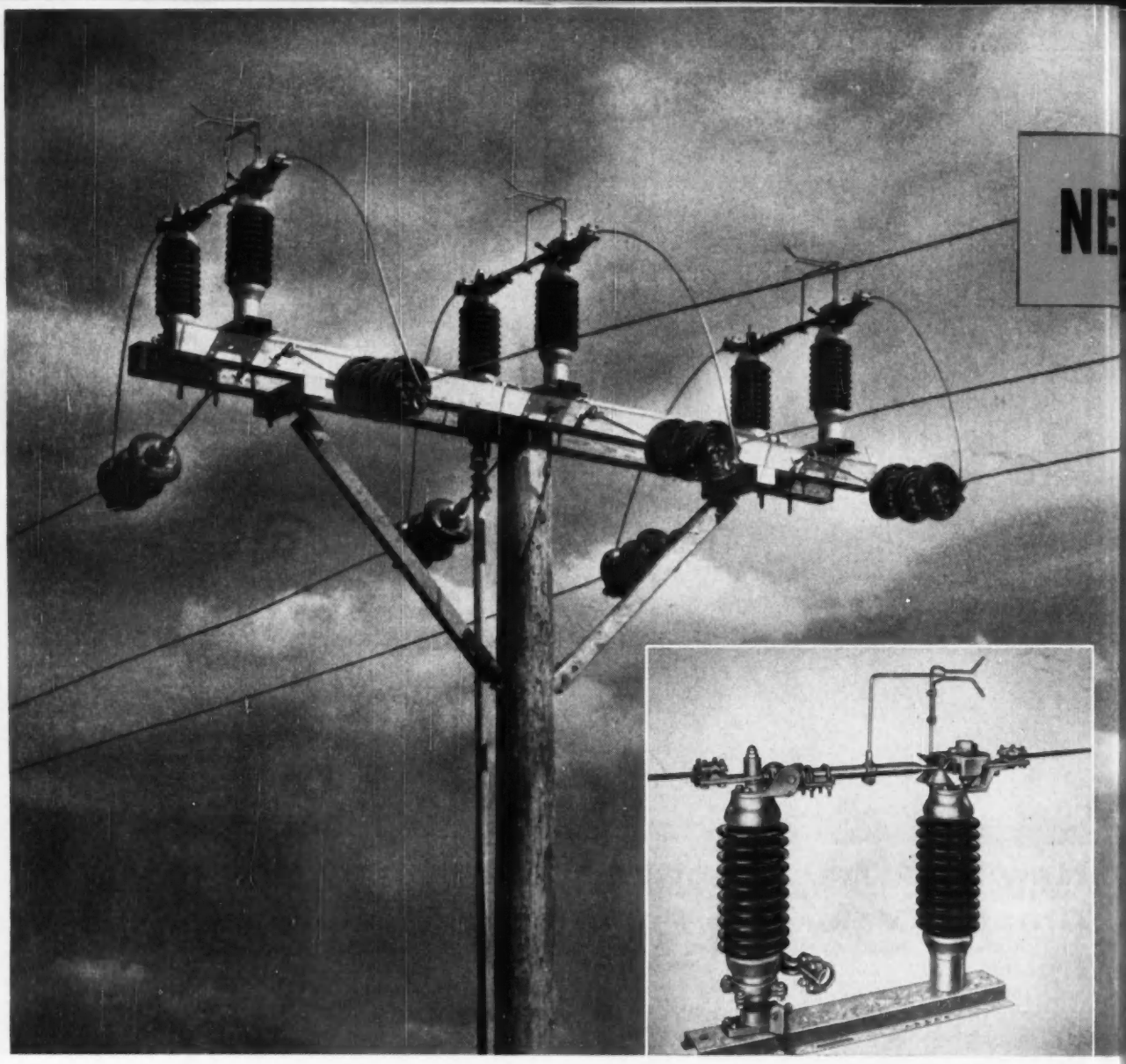


NO OTHER SIDE-BREAK DISCONNECT GIVES YOU ALL OF THESE OPERATING ADVANTAGES

- **Correct contact always maintained at blade tip even if crossarm warpage distorts the switch base.**
- **All blades engage fully in the break-contact jaws without precise adjustment of the inter-phase rods.**
- **Less time and labor to install with Kearney original wide-tolerance mechanical design.**
- **Easiest, surest ice-breaking ability available on both opening and closing.**

This newest Kearney development solves long-existing operating problems of crossarm mounted group operated side-break disconnects. The best supporting structure or crossarm construction may . . . due to ice loads, age, wind or line strain . . . deflect enough to distort the switch bases, or alter the relative positions of the three phases. This often causes loss of contact or failure of all blades to close completely in conventional disconnects with both rigid blades and stationary break-contacts.

Kearney's advanced design features a self-aligning blade constructed to permit controlled vertical movement and axial rotation. This automatically compensates for base distortion . . . keeps the blade tip correctly aligned in the contacts. The break-contact swings 30-degrees with the blade as it is opened or closed, producing high leverage ice-breaking ability and full wiping of the silver current transfer surfaces. On closing, the blade tip fully engages the break-contact before the contact moves from its angular open position, compensating for any shift in position of the switch bases. This same feature also allows considerable freedom in interphase rod adjustment, enabling Kearney *Self-Aligning* side-break switches to be installed faster and more economically than other types.

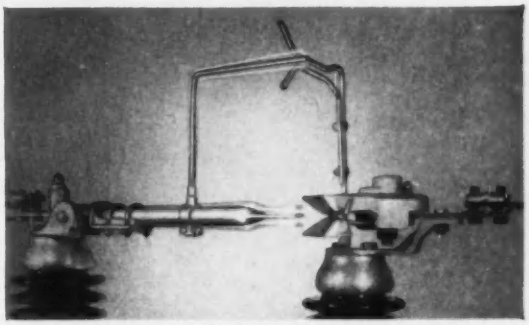
The details of these original features for maintenance-and-adjustment-free operation are shown on the facing page.

Kearney's

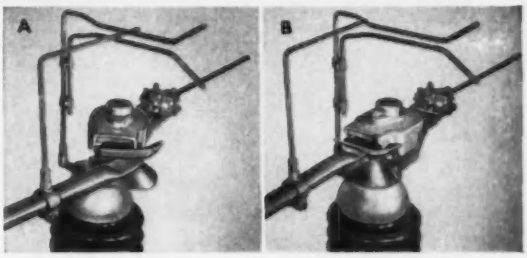
Self-Aligning SIDE-BREAK DISCONNECTS

...always make positive contact, even if the supporting structure warps, twists, bows or settles.

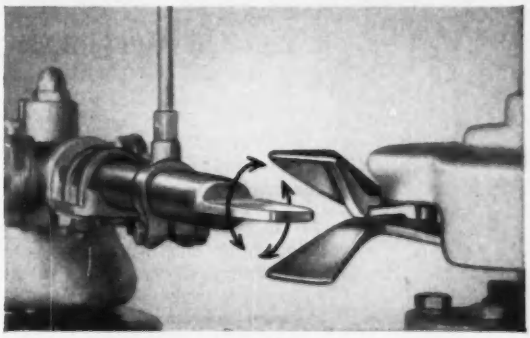
Self-aligning blade moves in a vertical plane to re-establish the original relationship between blade tip and contacts if supporting structure warpage distorts switch base. Wide mouth contact jaws assure blade entry into the contacts. Vertical 1¼" movement more than corrects for extreme cases of misalignment.



Break-contact swings 30° in the plane of blade travel as switch is opened or closed, providing highest leverage ice-breaking and full wiping of the current transfer surfaces. Note that the blade tip is fully engaged, and full contact is maintained (A) through the final 20° of blade travel to the fully closed position shown at (B). This feature allows more latitude in phase rod adjustment than other designs.



Blade rotates 12° on its longitudinal axis. If base distortion has affected blade-contact alignment, the blade tip will rotate as it enters the break-contact to keep all contact surfaces parallel, automatically restoring contact alignment. Friction reducing construction at all rotation points minimizes operating effort.



Switch carries full-rated load current well within NEMA temperature rise, from a fully closed position to 20° partially open position. Ratings available, 7.5 through 69 kv, 600 amperes. Equipped with conventional or whip-type arcing horns... torsional or spade-type operating mechanism. May be mounted horizontally, vertically, or underhung.

For full details talk to your Kearney representative, or write direct for Bulletin 8B.

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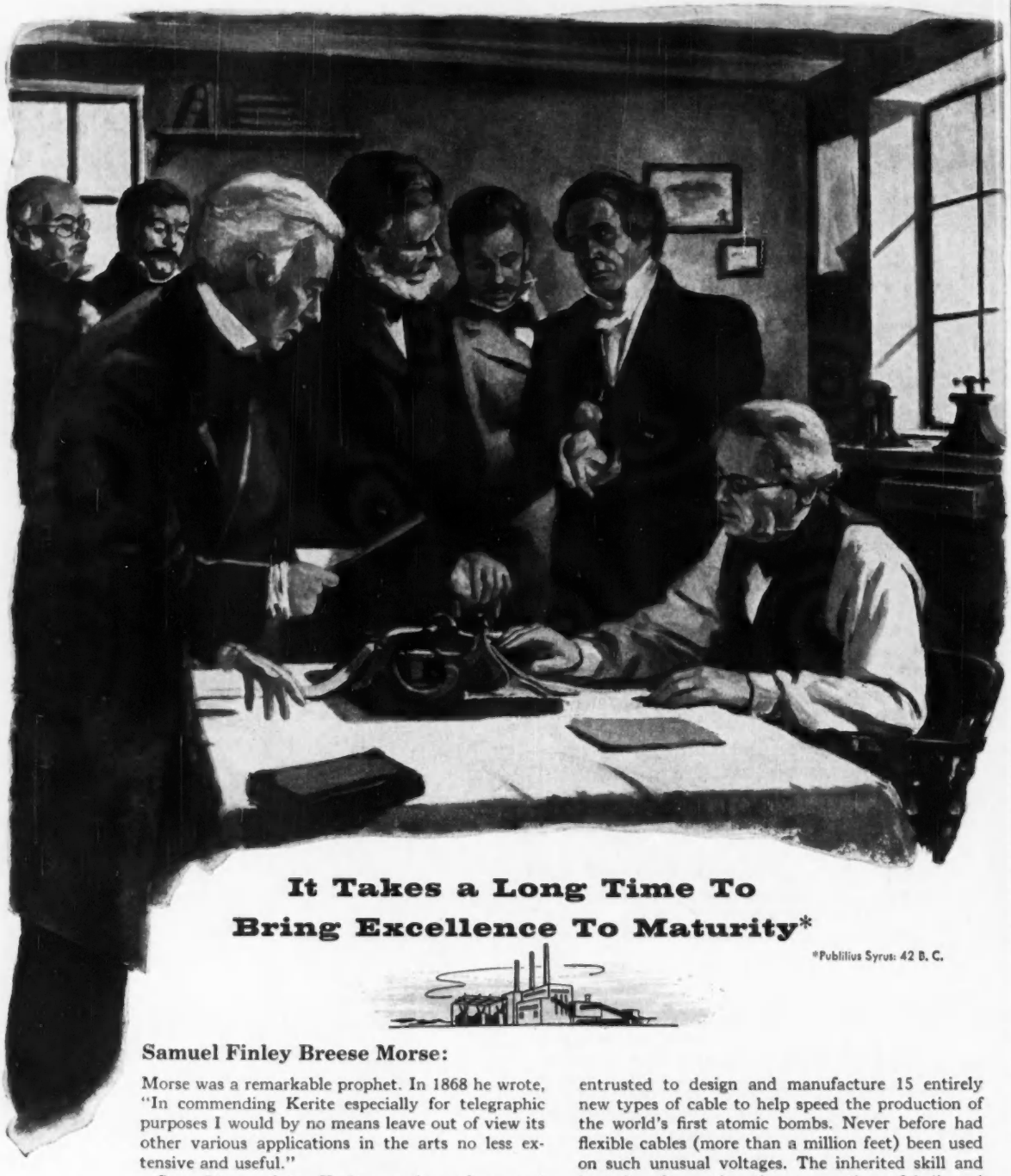

It Takes a Long Time To Bring Excellence To Maturity*

*Publilius Syrus: 42 B. C.

Samuel Finley Breese Morse:

Morse was a remarkable prophet. In 1868 he wrote, "In commending Kerite especially for telegraphic purposes I would by no means leave out of view its other various applications in the arts no less extensive and useful."

Some 70 years later, Kerite was chosen for a most singular art—the production of the first special cables for the Manhattan Project, Oak Ridge, Tennessee. The Kerite Company was *the only organization* entrusted to design and manufacture 15 entirely new types of cable to help speed the production of the world's first atomic bombs. Never before had flexible cables (more than a million feet) been used on such unusual voltages. The inherited skill and integrity of more than three generations of dedicated Kerite men insures the highest standards of manufacture of all Kerite cable—standards upon which American industry depends.

The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

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Intermountain Companies Push Bold Plan

Investor-owned utilities in the Rocky Mountain area have just demonstrated the type of initiative so vital to the survival of private industry in the face of government competition. With one bold stroke they may well have upstaged possible efforts by public power advocates to create a wide-flung integrated federal power network in the intermountain region.

On Oct. 1, these utilities, sparked by Utah Power & Light Co and Arizona Public Service Co, presented to the U. S. Bureau of Reclamation details of a well-considered transmission expansion plan. The scheme permits energy to be wheeled to federal preference customers from the major unit of Bureau's Upper Colorado River Storage Project at Glen Canyon. It also provides economic integration of the two private systems.

Other utilities in the region simultaneously offered plans to construct facilities for wheeling federal energy from the Project's Flaming Gorge unit, and to extend transmission and connections in such a fashion as to make the use of private company lines very attractive to the government.

What makes the whole plan so commonsensical is the major link involved, a 425-mi circuit from Salt Lake City to Flagstaff, Ariz., is justifiable economically on its own merits, especially considering the seasonal diversity between the growing Arizona and Utah systems.

Public power advocates probably will say that the utilities are moving belatedly to interconnect to forestall federal transmission lines through the area. But this is disproved easily. The record indicates clearly that in 1955 the intermountain private companies appeared before a Senate committee hearing on Upper Colorado Project authorization (EW March 14, 1955, p 8), and offered to provide necessary facilities to wheel energy from government hydro to federal preference customers. This new plan merely formulates the details.

Close examination of these details reveals engineering planning of a high order. Power from Arizona Public Service's Four Corners and Utah Power & Light's Kemmerer steam plants, timed to coincide with initial federal hydro output, is offered for close coordination.

The companies have suggested the government use the money authorized for expenditure on Upper Colorado River Project transmission by linking Glen Canyon and Four Corners. Similarly, they've proposed the Bureau extend this line past Four Corners and into Colorado. This would provide a second link interconnecting the newly-formed Arizona-Utah network with Colorado, since both Utah and Colorado are tied to the Northwest Power Pool already.

Private companies on numerous other occasions have shown themselves ready, willing and able to cooperate with the federal government to reduce Treasury outlay on multi-purpose projects. Frequently, their excellent plans have been twisted by public power advocates and politicians so as to look like the greedy scheming of profit-gorged trusts. Too frequently, these plans have succumbed to political attack.

Reaction thus far has revealed little evidence that such attacks will be forthcoming. It would be foolish, though, to assume immunity.

Yet we do know this action by the intermountain utilities provides a new essence of leadership. The plan is bold and dramatic. Rather than a counter-attack against well-coordinated and often well-entrenched public power schemes, it is a classical example of private initiative getting there first.

We believe these features will give the private company proposals the added allure which could tip the scales in favor of private enterprise. We applaud it—and we recommend the boldness of the action to all elements of private industry.

Interest Sparked in

Goal of better government brings new utility consideration of sessions that encourage employee participation in party of their choice

APPLIED CITIZENSHIP seminars at Detroit Edison prepare employees to act as discussion leaders for voluntary, once-a-week sessions for groups of 20 employees; workers will attend eight to 12 meetings, probably from 4 to 6 pm

After spending a day at a Detroit Edison Co seminar a few weeks ago an employee phoned a party district chief to find out who the precinct captain was. There wasn't any. The chief asked Detroit Ed's man if he'd like the job. The employee said yes, and got the appointment.

This is one of the results of the utility's recently inaugurated "Applied Citizenship Activity."

S. F. Leahy, vice president of employee relations, described the company's program in last month's Edison Electric Institute "Bulletin." The activity began when Public Affairs Counselors of New York held an applied citizenship seminar in April for a cross-section of management at Detroit Ed. The response was enthusiastic. Now 130 employees have attended the two day seminars.

Soon after Leahy's article, Electrical World turned to 15 electric utilities for views on the program and plans, if any, to emulate it.

Surveyed Utilities Divided

Five contacted companies said that comparable information projects are in the works or planned. Two indicated an interest in following suit if convinced the results warrant it. The reaction of a vice president in the South sums up the view of the remaining eight utilities: "We never want to do anything that could be construed as interfering in an employee's religion or his politics."

Of these eight utilities, however, four already are involved to some degree through information meetings on legislative matters affecting the industry or EEI's "American Economic System" program.

Leahy, the company's Applied Citizenship Committee chairman, elaborated on the program's aims and methods in a Detroit interview:

"We at Detroit Edison think a strong two party system is important for free enterprise in America. We don't care which party our employees choose to be active in, but we do want to get them to act, as private citizens. Our approach is a bipartisan one . . . We have no specific company axe to grind.

Grass-Roots Involvement Is Aim

"We are trying to see that more people get involved at the grass-roots level, so that they become better informed—so that the real issues and the real facts come to light . . .

"We don't urge our employees to do big political jobs, but try to get them to do the little jobs so important to a political party: ringing doorbells to get the vote out, stuffing notices in envelopes, putting publicity out, or canvassing for funds.

"We're trying to get people as individuals concerned in the regularly established party organization. Our program is not a 'big business' group. We feel it's much sounder for management to stay in the clear, and for the individual to make his own choice of what to do and how to do it."

The Public Affairs Counselors, headed by Joseph Eley and Clifford White, early this month were drawing on their own political experience and roles in leading college workshops on politics to train 20 Detroit Ed employees to act as discussion leaders. The graduates of these sessions will pair up to lead once-a-week voluntary sessions for groups of 20 employees. Meetings will run eight to 12 weeks and probably will occur from 4 to 6 pm.

"We feel our people can do a good job of educating others politically, after Eley and White train them," said Leahy. "The seminars point out how government affects our daily lives in our neighborhoods, and explore the structure of political parties in the county, state and nation, stressing how they actually work. The aim is to get each participant to take active political steps: to inform himself on a Lansing or Washington issue and report on it to the seminar, to write his Congressman, or to contact a precinct delegate for an assignment."

Leahy said the seminars aid employees to overcome political hesitancy: "After the sessions, the employee feels more confident of what he can do. He doesn't feel so much of a neophyte."

Interest Is Growing

White told EW, "There's a lot of utility interest in the workshops, but they're moving cautiously." The firm is in "the serious discussion stage" with four utilities now, and six letters of inquiry have arrived from other companies, he said.

Several companies EW contacted are interested in a workshop series developed by the U. S. Chamber of Commerce. One utility has authorized a nine-session workshop series for 15 of its management men who decided on their own to take it.

The CofC provided pamphlets, which serve as the discussion guide, at a cost of $6 per set. The leader of the workshops—in this case, the head of the utility's insurance de-

in Information Programs on Politics

partment—has a manual costing $12.

There is no lecturing involved in the workshop, which is called "Action Course in Practical Politics," although politicians from various local levels talk with the group in the final session.

As was the case with most companies contacted, a West Coast power company pointed out that its employees are active in non-political civic affairs. There has never been any program of political education and participation, however. The advertising manager, though, intends to study the CofC course with the aim of interesting management in it.

Municipal Avoids Role

A municipally owned system in the West studiously avoids involvement in anything with political overtones. The system used to put out literature and tried to reach voters in matters of bond issues and charter amendments, but a court ruling prohibited use of the system's funds for these purposes. Its employees, however, often raise funds on their own to carry the message.

The head of a company in the South said discussions have taken place on adoption of a formal policy encouraging employees to take part in citizenship activities. "We undoubtedly will adopt such a policy in the future," he said, adding that he regards the trend as one of citizen participation, not management participation.

The president of a Midwestern company believes it's "a pressing problem" to get more people interested in government at more levels, but, "frankly, I don't know whether it is a company's responsibility to push people into things."

A large company near the Great Lakes is aware of the Detroit Ed approach. While considering a program along these lines, the utility has not reached a decision yet. Although the company doesn't really encourage entrance of its employees into politics, it doesn't discourage them, either.

As its policy statement on the topic says: "Employees of the company are encouraged to take part in civic and community affairs. They should exercise their right to vote, perform jury duty, and contribute their personal time to . . . charitable, civic and community organizations.

"In addition, there may be times when an employee would like to accept an appointment, nomination or election to a public office. The company encourages such activity in general, providing the duties of the office do not adversely affect the employee's work with the company."

LEAHY: Aiding the political neophyte

The statement warns that, since the utility enters into contracts with many public agencies, an employee-office holder may "be regarded under the law as having an interest in one of their contracts," and would be open to criticism, if not to "fine, imprisonment, or both."

Even if no legal conflict exists, an employee's political activity could have "an undesirable" effect in the area of community relations. So, aspiring candidates are asked to check with their supervisors, and the public information and legal groups, "so they may clearly point out any legal or public relations hazards . . ."

In the Southwest a pair of companies now conducting EEI's "American Economic System" program state that no policy statement or program plans exist on encouraging applied citizenship.

In New England, the consensus of power company executives contacted was that employers should not engage in the broad field of political activity except on matters concerning the industry's welfare.

One utility has conducted an information program since 1948 under which employees get an interpretation of local, state and national legislative trends important to the industry. Topics are discussed factually; "We do not attempt to tell anybody what to do," a vice president said.

When it comes to programs beyond the direct and ramifying interests of the power companies, said an executive in the Northeast, political proselytizing would be self-negating, subject to employee resentment and charges of self-interest.

Governor Urges Participation

The utilities' differing views on encouraging citizenship activities parallels the divided opinion on the overall question of business in politics. Some politicians favor the businessman's entry into the arena. Pennsylvania Gov David L. Lawrence, for instance, told a Bucknell University conference late last month that government officials "must have the understanding, the cooperation and the active assistance of every segment of the population, including the business leaders whose talents and abilities can be invaluable." Bucknell Pres Dr Merle Odgers warned that continued political apathy would give more comfort to communism than anything else.

On the other hand, critics such as Connecticut Gov Abraham Ribicoff and former Cincinnati Mayor Charles P. Taft have scored the trend. As Taft puts it: "What is really self-interest, however justifiable, ought not to be blown up into civic spirit . . ."

These points were echoed by respondents to a "Business Record" survey of 198 companies. The majority, though, agreed that companies should take an active part in political and governmental processes. Reasons advanced by the majority are summed up in Leahy's "Bulletin" statement:

"The time has come to stop talking about the decline of self-government and to try to do something about it."

Conventional Fuels Will Dominate P

Deliberately side-stepping controversial issues, hearing on energy resources is told by Sporn that the atom will be major source of generation for 6-trillion kwhr by 2000

The Congressional Joint Economic Committee crammed up a major five-day hearing in Washington last week on U. S. energy requirements through the end of the 20th century.

Importance of the hearings—undertaken by the committee's subcommittee on automation and energy resources—will be their use in a new basic document on energy needs. Rep. Wright Patman (D.-Tex.), subcommittee chairman, pointed out that the group's work probably would provide an updating of the old Paley commission report on energy resources, now seven years old. Patman added that the group intended, basically, to review "the adequacy of our resources" and to study "the impact of technology on the production and efficient use of the energies required for sustaining economic growth."

Controversies such as the public-vs-private power fights, imports of power equipment, subsidies, and incidential benefits from multi-purpose hydro projects were purposely left out of the hearings. Patman did suggest: "There are and will be other forums—perhaps future hearings of this subcommittee—for the discussion of these issues."

ADAMS: An adequate power supply

Leading witnesses on electric power resources were Philip Sporn, president of American Electric Power Co; Francis L. Adams, chief of the Federal Power Commission's bureau of power; and Walter Zinn, president of General Nuclear Engineering Corp. Other witnesses on oil, coal, and natural gas included FPC Commissioner Arthur Kline; Pres Joseph Moody of the National Coal Policy Conference; Philip Mullenbach, vice president of Growth Research, Inc.; Sam Schurr, chief of the energy division of Resources for the Future.

Fuel Resources Adequate

Conventional fuels will continue to dominate all other forms of power generation through 1975, it was pointed out by all witnesses. And it was also made clear that U. S. fuel resources are more than adequate for the foreseeable future.

"There is ample reason to believe that the power supply will be completely adequate to meet the nation's growing loads, and that engineering talent will continue to be utilized to improve electric utility operations and bring about economies in costs," FPC's Adams told the group.

Adams also testified that "there is little likelihood that Russia will overtake this country within the next 20 years in the production of electric power." By 1975, he said, the U. S. is expected to lead the U.S.S.R. in annual energy generation by 870-billion kwhr. This is in contrast to a lead of 228-billion kwhr in 1958.

Adams emphasized the recent FPC predictions that U. S. power needs in 1980 will reach 2-trillion kwhr yearly, requiring an additional 320-million kw of installed capacity (20-million kw in industrial plants). This additional capacity probably will be broken down: 265-million kw in steam generation, 35-million kw in hydro plants and 3 or 4-million kw in internal combustion plants. He predicted little change through 1980 in the relative position of coal, gas and oil as steam generating fuels, and added that a total of 50-million kw of nuclear generation by 1980 is his guess.

Sporn estimated an even higher demand for power generation in the future: 2-trillion kwhr a year by 1975 and 6-trillion kwhr by 2000. And, in turn, he predicted a slightly larger piece of the generating pie would go to nuclear plants by 1975—7.5% as against about 5% estimated by Adams.

Sporn's estimated fuel needs for generation in the year 2000 showed a large jump in nuclear plants: "Nearly 40% of this total (of 6-trillion kwhr) will still be generated by coal (in 2000), a small amount by fuel oil and gas, a somewhat larger but still relatively small amount by

Two Companies, P

An agreement for coordinated construction and use of EHV transmission facilities in New York State has been reached by Niagara Mohawk, Rochester Gas & Electric, and the Power Authority of the State of New York. Under the agreement, PASNY will extend its proposed Niagara Falls-Syracuse 345-kv line to the Niagara Mohawk Porter substation near Utica and make the unused capacity of the line available to Niagara Mohawk and RG&E.

In turn, Niagara Mohawk will guarantee PASNY use of its existing 230-kv twin circuit line from Porter sub to the authority's Adirondack sub. Two existing 230-kv PASNY circuits connect Adirondack sub to the St. Lawrence Power Project. The 230-kv Syracuse-Adirondack line originally proposed by PASNY will not be built.

In addition, RG&E and Niagara Mohawk will build the necessary substations to be served from the 345-kv tie line. The private utility substations will replace the bulk substations originally planned by PASNY for the Rochester and Syracuse areas. Niagara Mohawk's recently completed Porter substation

Power Generation to 1975

hydro-electricity, and the largest percentage by nuclear energy. Compared with my estimate of 475-million tons of coal and 50-million tons of coal equivalent of nuclear power for 1975, for the year 2000 I estimate coal burned for electric power generation at 600-million tons, but nuclear power at the equivalent of more than 850-million tons."

Sporn, however, cautioned the subcommittee that, "Although fuel and power play an important role in a modern industrial economy, they do not play the decisive role frequently assumed for them. In the generation of electric power, for example, the cost of fuel in the U. S. is neither the largest item of cost nor the determinant of the use of electric energy . . .

"I do not mean to minimize the role which low-cost electric power has played in the rapid growth of residential consumption of electric energy . . . but I do want to show that cost of power is not the decisive factor. When a refrigerator, for example, costs $400-500 in capital outlay and the power to operate it only about $15 a year, it is clear that what primarily determines whether a family obtains the appliance and consumes the power necessary for its operation is the cost of the appliance and not the expense of the power to run it."

Schurr estimated the biggest gain in energy consumption by 1975 (over 1955) would be electricity—up 210.6%. Other fuel sources also would gain, except anthracite, he predicted: Hydro power up 120.8%; natural gas up 106.8%; oil and petroleum liquids up 95.2%; bituminous up 74.9%; anthracite a drop of 30%.

SPORN: Cost factor isn't decisive

Power Authority Agree on N.Y. Interconnection

will be enlarged to handle the increased power load. Robert E. Ginna, chairman of the board of RG&E, estimated that the substation near Rochester would cost as much as $6 million. The power authority will acquire the substation site.

According to the PASNY statement, the authority's main objective is to bring about construction of a grid that will:

1. "Insure that we have adequate interconnection between the power authority's plants, thus increasing firm capacity to the fullest possible extent.

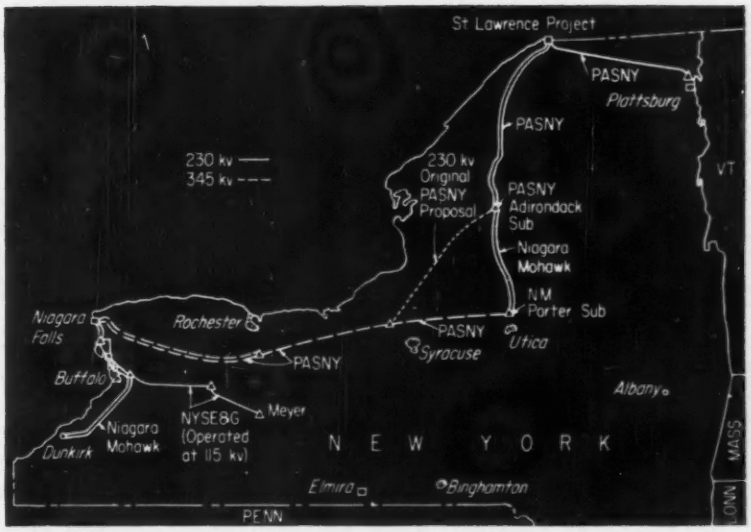
2. "Best serve the customer within the economic market area in whatever way the power is distributed, whether by us or by private utilities or both. . . .

"This modified plan will avoid paralleling and duplication of existing transmission lines, take advantage of private utility lines, increase our potential revenue from the transmission grid, and reduce capital costs paid by the ultimate consumers."

Although present plans call for a single circuit from Rochester to Utica, right of way is being acquired for two circuits for the entire distance.

The 345-kv line will obviate Niagara Mohawk's earlier plans for a 230-kv Buffalo-Syracuse line. Neither Niagara Mohawk nor the authority has announced any plans for EHV construction east of Utica. An RG&E spokesman said their substation construction commitment would not affect previously announced long-term plans for expansion.

PASNY has also announced a contract award for the aluminum conductor for the Niagara Falls-Syracuse section of the proposed 345-kv line.



FIRMED-UP CAPACITY of St. Lawrence, Niagara projects depends on grid

Hydro Developments Highlighted By The D

Dedication of The Dalles Dam by Vice President Richard M. Nixon, the possibility of smoother sailing on the Passamaquoddy tidal power project, and a host of Federal Power Commission actions highlighted hydro-electric developments in recent weeks.

Nixon on Oct. 10 started the tenth of 14 units of 76-Mw capacity each at the $250-million project on the Columbia River. When completed late in 1960, The Dalles Dam will produce 1,119 Mw; ultimate capacity will be 1,743 Mw. The Army Corps of Engineers started the dam in 1952 when it was estimated that the project would cost $350 million. The Corps attributed the $100 million saving to sharply competitive bidding.

In touching on competition between the Corps and the Bureau of Reclamation and the varied views on who should develop hydro projects, Nixon said this is "not bad in itself provided the competition does not become mutually destructive.

"If we call into play the facilities of the federal, state and local government and private enterprise the resources of the country will be developed to the full," he declared.

Second Only to Grand Coulee Dam

The Dalles will be second only to Grand Coulee Dam among Columbia River power producers. It is the largest multi-purpose project the Corps of Engineers has yet built and, as Lt Gen E. C. Itschner, chief of Engineers, remarked at the dedication, it produces more power than the U. S. gains from the St. Lawrence project.

To provide space for the ultimate 22 generators the powerhouse was set parallel to the current, virtually in mid-stream. A concrete spillway section set at right angles to the powerhouse at its downstream end connects to the Washington shore while an earth fill section curves from the upstream end of the powerhouse to the Oregon shore. Total length of the dam is 8,700 ft. Height is 120 ft at the spillway section, 200 ft at the powerhouse and 280 ft at the earthfill section. The spillway is designed to handle a 2,290,000-cfs flow.

Passamaquoddy Study Is Said to Favor Plan

The International Joint Commission, representing Canadian and U. S. interests, has received an engineering study which is reportedly favorable to the Passamaquoddy tidal power project.

The three-year, $4-million survey has resulted in two reports—one on construction aspects and the second on the project's probable effects on herring and sardine fisheries. The reports are expected to be released in a week or two. On the basis of the reports, the IJC will make recommendations to the U. S. and Canadian governments.

Under discussion for 40 years, Passamaquoddy would involve a series of dams on the Maine-New Brunswick coast to harness the tides in the Bay of Fundy.

The tides could produce about 2-million kwhr annually.

The IJC is hopeful that both governments will also accept the proposal for construction of British Columbia water storage projects which would conserve 26-million acre-ft of water. Winter releases from these projects could increase the output of dams in the U. S. by about 4,000 Mw. The Canadian projects would include provision for future power stations on the upper Columbia.

The U. S. would return some 2,000 Mw to Canada for the 30 to 50-year life of the agreement. Under the proposal, Canada would retain the right to divert some of the water into the Fraser River.

New Formula Slated on Missouri Basin Allocations

The thorny problem of allocating power from Missouri Basin dams may be eased by a new formula which the Interior Dept is expected to announce in a month or so. The formula factors in the additional capacity at Ft. Peck, Garrison and Oahe dams, but even with these additions requests still exceed the supply, says Interior Secretary Fred Seaton.

The Interior Dept plans to move ahead rapidly in beginning work on new construction starts voted recently by Congress over the President's veto. Acting Interior Secretary Elmer Bennett expects bid and award procedures on the new projects to be carried out "as promptly as possible, and in most instances before the end of the fiscal year (June 30, 1960)."

Bennett adds that the Bureau of Reclamation has apportioned more than half of its total budget to be spent during the first quarter of fiscal 1960—which has already ended. Total apportionment will be $276,687,642 for the year with $155,413,666 to be spent during the first quarter.

A $487,500 fund to start construction on the Burns Creek Dam in Idaho has been placed in reserve pending authorization of the project by the House of Representatives. Other new USBR starts, for which funds were approved by Congress, will be started as soon as possible. They include the Trinity Dam power plant.

In another development, Reclamation Commissioner Floyd Dominy announced that all power produced at the federal Parker and Davis projects on the lower Colorado River will be sold to preference customers after July 1, 1962, except for a single unique sale to California-Pacific Utilities Co.

The reason for the change, said Dominy, is the "tremendous growth of power loads in the Southwest" among preference users. The sale to Cal-Pac of a 6,000-kw block stems from a U. S. Court of Claims ruling in a damage suit against the government.

Eleven existing customers in California, Arizona and Nevada have been notified that their contracts will expire Dec. 31, 1962, and three more non-preference customers also will have their contracts modified to expire then.

At the same time, the USBR is calling for applications from preference customers to take power from Parker-Davis, which presently produce 237,525 kw of firm energy a year under several commercial rate schedules. After re-allocations, a uniform rate schedule will be used.

Tacoma City Light's Cowlitz River development is

Dalles Dedication

facing a new attack. The opposition comes from within the city in contrast to earlier objections, largely from commercial and sports fishermen.

A committee is planning to circulate petitions calling for a vote on a proposed city charter amendment prohibiting construction on the Cowlitz project until at least 1967. To get the amendment on next March's ballot, 5,800 signatures are needed.

Objections of the committee are based on possible rate increases resulting from construction costs, and the availability of cheaper power from Bonneville Power Administration for at least five years. Observers feel the committee may be obtaining support from Tacoma City Light's largest industrial customers who are interested in maintaining their present rates.

Georgia Power Cooperates on Coosawattee

In developments in the South, Georgia Power Co is cooperating with Corps of Engineers on surveys for the Coosawattee project. Under the company's proposal, the government would build the dam and reservoir and GPC the powerhouse. Meanwhile the initial 18-Mw unit at the company's Oliver Dam has been placed in operation.

Alabama Power Co is seeking approval for changes in its Coosa River project. In petitions before the state commission and the Federal Power Commission, APC asked for authority to **1.** Eliminate a proposed dam at Wetumpka. **2.** Elevate Mitchell Dam pool 5 ft to increase output by 65 Mw. **3.** Elevate Jordan Dam pool 7 ft and construct a 246-Mw plant at the head of an 8-mile canal linking Jordan Lake with the Coosa below Wetumpka.

If approved, the plans will up APC's total Coosa outlay to $175 million, an increase of $40 million.

Early 1960 Hearings Predicted on Mountain Sheep

Chances are strong that the FPC's hearings on the license application for a High Mountain Sheep Dam won't be set until early 1960 because of the present backlog of cases. The Pacific Northwest Power Co's proposed project may stir up more controversy than the recent Hells Canyon case, say Washington observers.

PNP—composed of Pacific Power & Light, Washington Water Power, Montana Power and Portland General Electric companies—first applied for a high dam at the site in the spring of 1958 after FPC had rejected the group's proposed two-dam project in the same stretch of the river at Mountain Sheep and Pleasant Valley sites.

The revised application (EW, Oct. 12, p 165) proposes five 175-Mw units providing 1,000 Mw initial maximum capability. Ultimately five more 175-Mw units would be installed. Total cost would be $178 million.

One point emphasized in PNP's revision is the project's advantages in relation to the alternate Nez Perce project. Construction of either Nez Perce or High Mountain Sheep would block off construction of the other. PNP Pres John Burke states that a single-dam "Nez Perce development would provide lesser resource development" than High Mountain Sheep in conjunction with another dam across the Salmon River at the lower canyon site. The lower canyon project is not included in PNP's present application.

TOUR OF THE DALLES DAM by Vice President Richard Nixon is guided by Glen Blegen, left, chief resident engineer. Corps Chief Lt Gen Itschner and Mrs. Nixon follow

In other FPC matters, PUD No. 1 of Skamania County, Wash., has asked for a license to build a 30.6-Mw run-of-the-river plant on the Little White Salmon River. A presiding examiner of FPC approved California Oregon Power Co's request to include five existing hydro developments, one existing, and one proposed regulating dam under a single 50-year license. Hearings begin Nov. 3 on Virginia Electric & Power Co's application to build a 200-Mw, $47-million plant on the Roanoke River. Hearings on Portland General Electric Co's proposed 247-Mw Round Butte project begin Nov. 30.

Early this month the Tillamook County PUD filed applications with the Oregon Hydroelectric Commission and the state's Water Resources Board for preliminary permits for construction of projects on the Trask and Hehalem rivers. About 20 Mw would be produced at two dams for costs ranging from $5.25 to $12.25 million, depending on site selection and dam height. A revenue bond issue would finance the projects, if voters approve.

An unforseen rock decomposition in the foundation and necessity for a stronger concrete spillway will add $1,625,000 to the low bid of $2,176,000 for Ice House Dam, on Sacramento Municipal District's Upper American River project. The dam will be completed in January and will supply water for Jaybird powerhouse.

3 Factors Focus A

Growing system peaks, levelling-off of efficiency gains, and availability of low-first-cost units call for new look at peaking capacity, National Power Conference hears

SESSION ON PEAKING CAPACITY was led by R. W. Dodson, Southwestern Electric Power, W. D. Marsh and A. G. Mellor, both GE, and A. R. LeBailly, Sargent & Lundy

Generating units designed specifically for peaking are commanding attention in the industry because of the disproportionate rise of system peaks, the "efficiency plateau" for new base-load units, and the availability of low-first-cost units for peaking. Greater interest is being shown in operating and maintenance problems attending the use of older machines for peaking. These subjects and others covering the mechanical end of steam-electric stations were discussed during the National Power Conference, Sept 27-30, Kansas City, Mo.

Need for low-cost peaking capacity was laid down by R. W. Dodson, Southwestern Electric Power Co, who pointed out that 30% of the 1958 summer peak on his system lasted only 14% of the time and accounted for only 2.9% of annual generation. For this small amount of energy during the system peak, fuel economy of peaking units is practically of no importance.

Because of peculiarities in fuel contracts, said Dodson, his company operates newer, more-efficient gas-fired units as peaking capacity initially. For more economical use of these units as base-load generation, Southwestern Electric Power designed a 100-Mw, 1,450-psi, 1000-F non-reheat turbogenerator installation for peaking service at Arsenal Hill. Estimated installed cost of this unit is $13 less per kw than a base-load reheat machine of the same rating, obtained through elimination of duplicate standby equipment. Operation of the peaking unit will be as automatic as possible to hold operating personnel to a minimum.

Steam turbines are the most favorable solution for large peaking units, said A. R. LeBailly, Sargent & Lundy, with possible reductions of $20 per kw for a 100-Mw gas-fired peaking machine if built at an existing steam plant. In the design of a peaking plant, consideration was given only to those variable components which affect the cost materially, ie, turbine, condensing equipment, boiler and appurtenances, feed water system, piping, instrumentation, and intake crib. Three sets of steam conditions for a 20-in. tandem-compound double-flow turbine were studied: 1,450 psi, 1000 F, 810,000 lb/hr; 1,250 psi, 950 F, 875,000 lb/hr; and 850 psi, 900 F, 910,000 lb/hr.

Closed feed-water heaters would be eliminated, with a deaerating heater used to raise feed water to 300 F. The condenser would have less surface, resulting from a high back-pressure design, 0.03 cc deaeration and single-pass long tubes. Two half-size condensate water pumps and two half-size boiler feed pumps are included. Boiler design is based on a 500-F exit gas temperature instead of 300-F to reduce heat-recovery equipment, with furnace design based on a higher heat rate. Two half-size forced draft blowers are used.

DIESEL UNIT OR STEAM TURBINE for peaking? One is favored by J. J. Trainor, PS of Indiana; the other, by R. F. Danner, Oklahoma G&E Co

Piping costs can be reduced through simplifications, fewer valves, bypasses, and higher steam velocities. Based on manufacturers' estimates and current price lists, use of lower-pressure units would reduce costs up to $23 per kw compared with 1,800 psi, 1,000/1,000 F and up to $19 per kw compared with 1,450 psi, 1,000/1,000 F.

The higher heat rate of peaking units, said LeBailly, is of little significance and the added operating cost is small compared with possible first-cost savings. He said a unit having a 3,000-Btu/kwhr higher heat rate and operating 1,000 hr annually on 20-cent fuel would have an annual fuel cost increase of only 60 cents per kw. This increase capitalized at 15% would be offset by a reduction in investment of only $4 per kw. He suggested that acceptance by the industry of a few standard sizes of steam-turbine peaking units would further lower the installed cost.

About 30% of the savings in steam-turbine peaking units lies in the boiler design, said E. L. Damon, Foster-Wheeler Corp. One promising approach is a boiler supercharged with a conventional diesel engine supercharger, with the cylindrical boiler having symmetrical surfaces for higher heat-release rates with minimum risk. Such a boiler

Attention on Peaking Capacity

can accept load as fast as the turbine will and is adaptable to automatic controls.

R. F. Danner, Oklahoma Gas & Electric Co, reported that studies of non-reheat units larger than 100 Mw show savings over gas turbines, even with transmission savings credited to the latter. The industry should look at 150-Mw or 175-Mw steam turbine units for peaking service, he offered. Installed cost of the "minimum" oil-fired non-reheat unit is about 70% of that for a coal-fired reheat unit, said William Welsh, Jr., Long Island Lighting Co. And this is about what gas turbines cost per kw, he added.

Push-button Capacity Needed

"What we need is push-button capacity at the load center" said J. J. Trainor, Public Service Co of Indiana, adding that "while steam-fired units have their place, they need cooling water and transmission to the load center." A Public Service study showed that millions of dollars can be saved by using diesel units, he said.

C. D. Galloway, L. K. Kirchmayer, W. D. Marsh, and A. G. Mellor, all of General Electric Co, presented a program for digital computer calculation of the most economical method of providing peaking capacity. Objective of the program for an IBM 704 computer is appraisal of generation expansion patterns to determine if savings can be achieved through the addition of low-first-cost, lower-efficiency units.

To simulate the performance of an electric system with a high degree of accuracy, the authors pointed out, the program includes these features:

1. Units are scheduled on an equal incremental cost basis.

2. The computer model permits accurate representation of the chronological variation of hourly-loaded units throughout the study period.

3. Daily load cycle is modified continuously to recognize the variations in load that occur daily, seasonally, and over the long term.

4. Units are started and stopped to meet spinning reserve requirements.

5. Maintenance is scheduled on the constant-risk principle.

6. Effects of inflation are included.

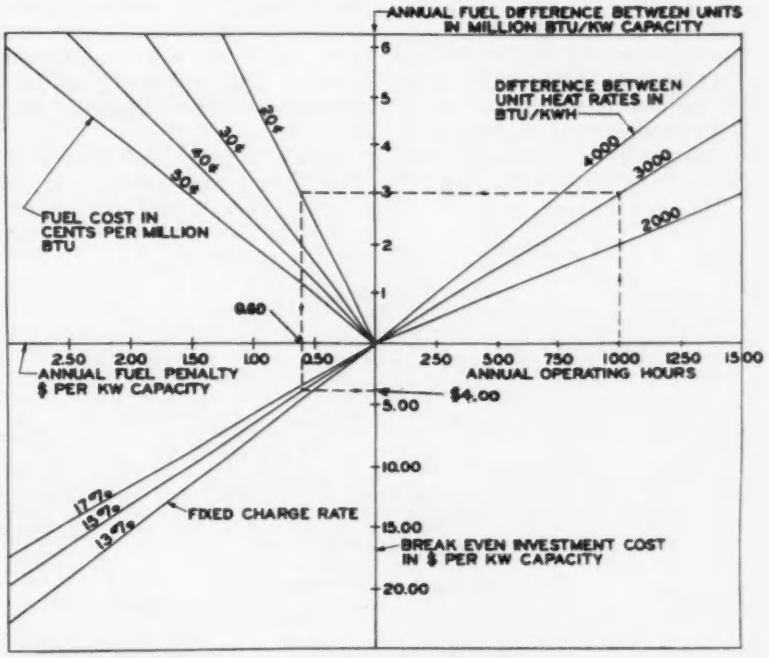
Among the data calculated for each unit during each year of the period are costs covering fuel, operating plus fixed and variable maintenance, and total production, as well as average heat rate, hours on the line, total generation, capacity factor, and present worth of total production cost. Modifications to the initial program will include the effect of forced outages, investment cost for generation, and transmission and interconnection capacity added during the study period.

Minimum recommended protection for unit-connected steam stations, as determined by the working group on steam station protection, Power Generation Committee, AIEE, was presented by D. M. Sauter, Westinghouse Electric Corp. Protection schemes described are the minimum necessary to maintain a high quality of service, said Sauter. They serve as a base point from which to evaluate each additional element of automatic protection. The overall protection schemes covered boiler, turbine, generator, main transformer and auxiliary system.

The minimum protection described will be inadequate for the mechanical end of the steam plant, said Joel Kessler, Black & Veatch, adding that flame detection and air-fuel ratio detecting devices should be included. J. M. Driscoll, P. T. Onderdonk, and R. L. Webb, all of Consolidated Edison Co, said considerable difficulty exists in obtaining the quality and reliability necessary for protection in devices which detect abnormal conditions in the boiler or turbine. Though problems exist in getting proper quality in transducers and new relay equipment, the authors said performance covering 17 unit-years of operation shows about 0.04% of outage time is due to improper protective relay operation.

Conclusions drawn by E. H. Finch, Sargent & Lundy, were that in controlling and interlocking a gas-fired turbogenerator: (1) the trend toward more reliance on electrical and mechanical protective

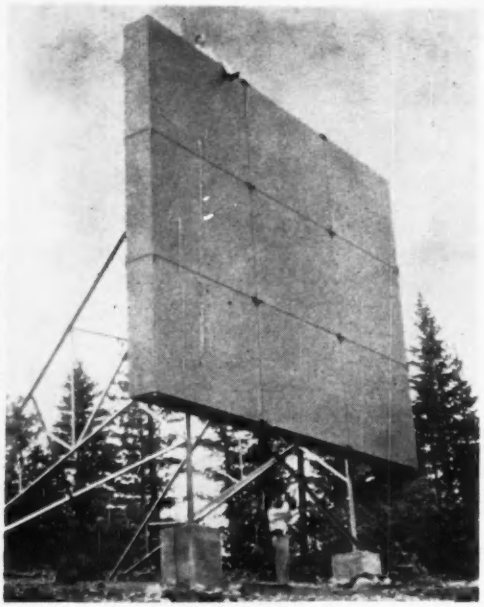
(*Continued on page* 72)



HIGHER HEAT RATE OF PEAKING UNITS is of little significance, says A. R. LeBailly. Annual increase of 60 cents per kw capitalized is equal to $4 per kw, while the possible first-cost saving of a peaking unit runs up to $23 per kw

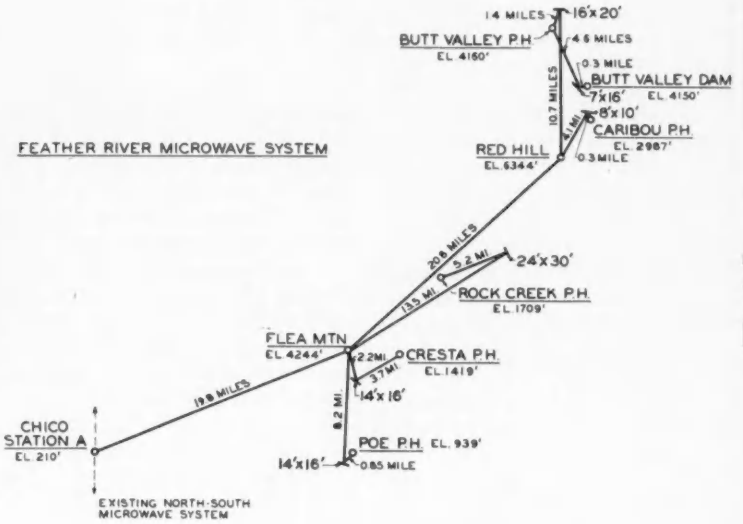
Microwave Operatio

New 6,700-mc PG&E equipment over 96 path-miles uses eight hops, two mountain-top, seven terminal stations



REFLECTOR PANEL is largest on Feather River. Panels are of aluminum

MICROWAVE SYSTEM installed by PG&E along Feather River in California



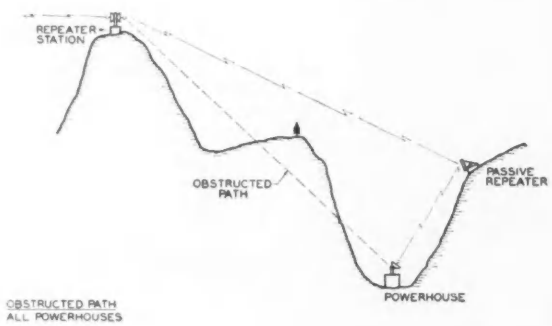
J. W. SOMERS, Communications Engineer, Pacific Gas & Electric Co, San Francisco, Calif.

New microwave equipment of Pacific Gas & Electric Co has so many reflectors that its operation resembles the one and two-cushion shots in a billiard game. This 6,700-mc equipment was added to the system with several unattended hydro plants on the Feather River in mountainous northern California.

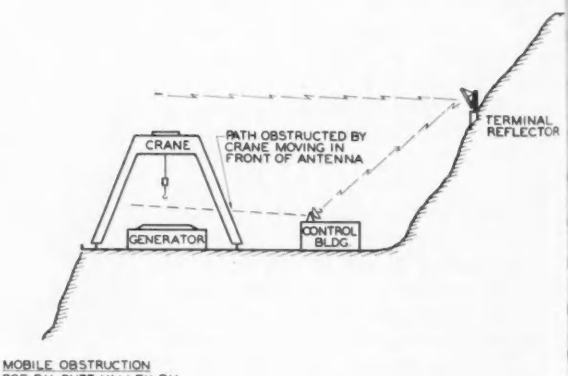
The initial installation of 96 path-miles in eight hops involves two mountain-top active repeater and seven terminal stations. Six terminal paths have plane reflectors or "billboard" type passive repeaters to overcome remote obstructions. Four paths involve an additional bounce, using antenna-reflector systems to avoid trees or terminal mobile cranes.

Reflectors range from 8x10-ft at Caribou on the shortest hop to 24x30-ft near Rock Creek on the longest hop. Although reflector panels are aluminum sheets only 0.064 in. thick, the air-frame construction and rigid supporting structure provide a reliable passive device requiring little more than annual inspection. Careful alignment established all paths as soon as the equipment went on the air.

PG&E decided upon microwave in spite of very limited line-of-sight conditions in consideration of a saturated power line carrier spec-



PASSIVE REPEATERS situated strategically are used to circumvent some mountainous projections over 96 path-miles



TERMINAL REFLECTORS effectively bounce signals so as to avoid local obstacles, such as buildings and large cranes

Resembles Billiard Cushion Shots

trum and years of experience with wire lines made unreliable by exposure in Feather River Canyon. There are 12 voice, four supervisory, six telemeter, six alarm, and two relaying channels. Addition of three terminal stations and further centralization of power system metering and control will increase system channel loading.

The baseband spectrum from 200 cycles to 50 kc was reserved for 120 direct-application frequency-shift or keyed carrier tones for control, telemetering, relaying, and alarms. Immediately above 50 kc is the ringdown party-line service channel which appears at all microwave terminal and repeater stations with connections to attended telephone switchboards.

The service channel and all other voice channels are single sideband suppressed carrier with out-of-band signaling. The baseband from 50 to 520 kc has capacity for 60 voice channels. The six-way interconnection at Flea Mountain repeater has 4-way passive combining networks teamed with paralleled amplifiers on separate power supplies for reliability.

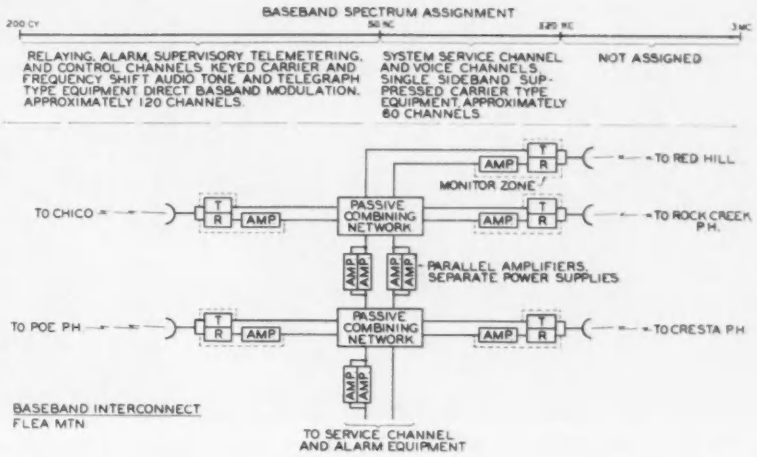
Zones of equipment fault supervision initiate transfer to standby during a failure. All microwave equipment has full standby, although only some spare equipment is supplied for multiplex channeling.

Protection for the 5-mile 220-kv line between Poe and Cresta powerhouses is included in the first microwave relaying channels on the system. Both directional blocking and permissive transfer trip channels are carried through the active repeater station at Flea Mountain.

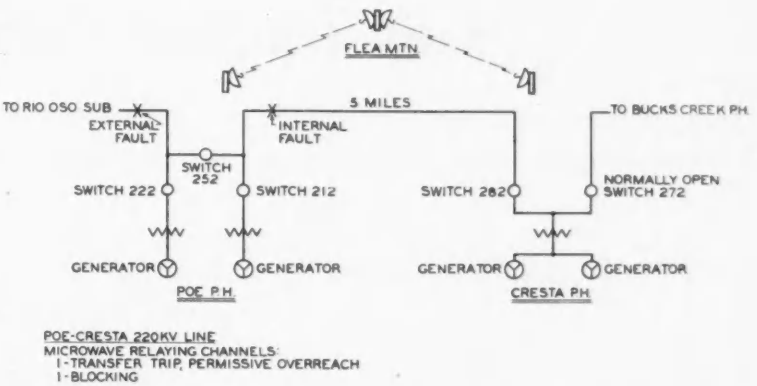
The blocking channel is 520 kc with 4-kc frequency shift on external line faults, the slower transfer trip channel being 44 kc with 1 kc shift on internal line faults. Both are continuously monitored to alarm on failure. The transistorized trip channel includes circuitry for noise discrimination. Either or both channels can be selected for operation. Experience will show which is better.

To provide reliability of power supply and avoid interruption of

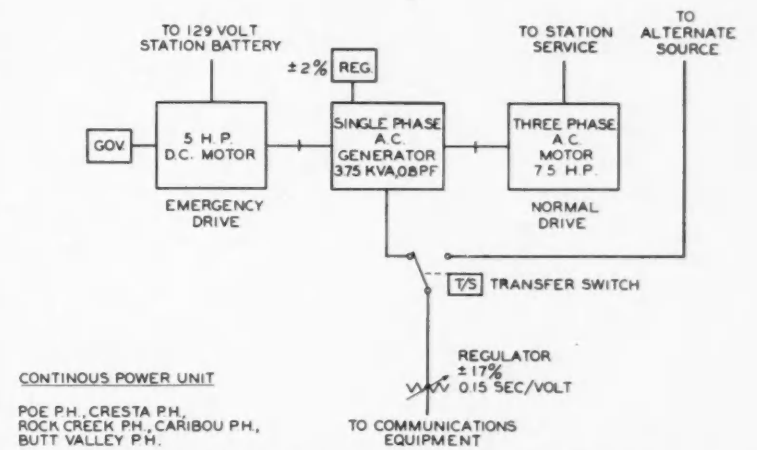
(*Continued on page* 118)


BASEBAND SPECTRUM ASSIGNMENT
200 CY
50 KC
520 KC
3 MC
RELAYING, ALARM, SUPERVISORY TELEMETERING, AND CONTROL CHANNELS KEYED CARRIER AND FREQUENCY SHIFT AUDIO TONE AND TELEGRAPH TYPE EQUIPMENT DIRECT BASBAND MODULATION. APPROXIMATELY 120 CHANNELS.
SYSTEM SERVICE CHANNEL AND VOICE CHANNELS. SINGLE SIDEBAND SUPPRESSED CARRIER TYPE EQUIPMENT APPROXIMATELY 60 CHANNELS
NOT ASSIGNED
TO RED HILL
MONITOR ZONE
TO CHICO
PASSIVE COMBINING NETWORK
TO ROCK CREEK P.H.
PARALLEL AMPLIFIERS, SEPARATE POWER SUPPLIES
TO POE P.H.
TO CRESTA P.H.
BASEBAND INTERCONNECT FLEA MTN
TO SERVICE CHANNEL AND ALARM EQUIPMENT

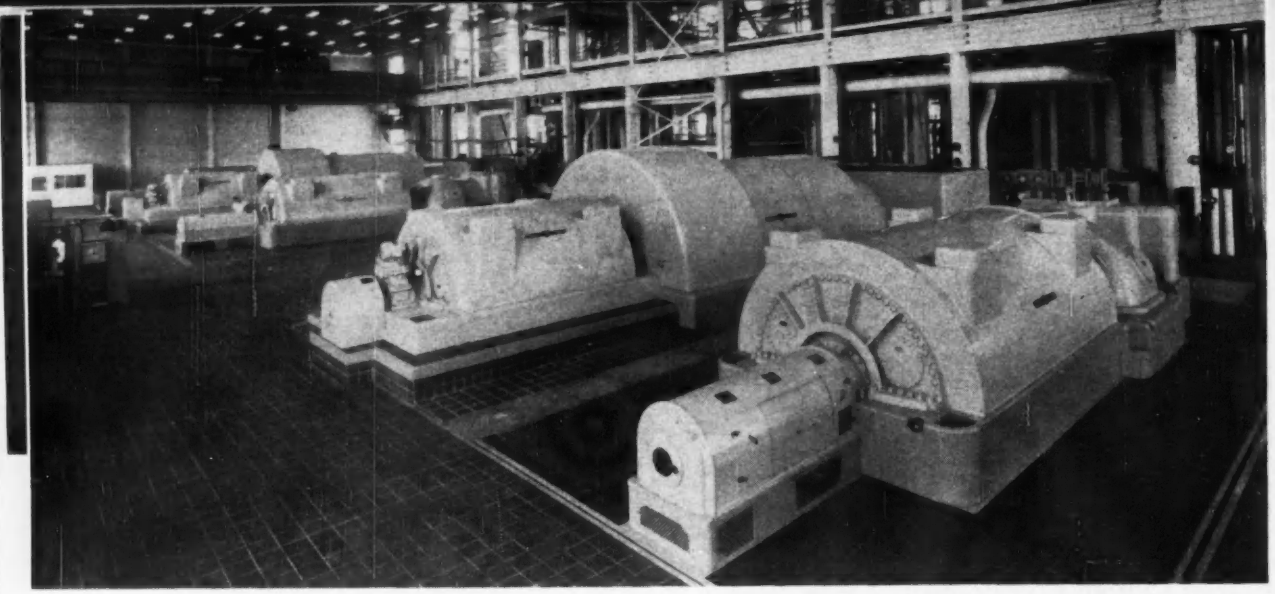
BASEBAND SPECTRUM reserves 200 cycles to 50 kc for control, relaying, alarms. There are 60 voice channels in that part of the spectrum between 50 and 520 kc



MICROWAVE RELAY CHANNELS protect the 5-mile, 220-kv transmission line between the powerhouses at Poe and Cresta. These channels were system's first



CONTINUOUSLY ROTATING POWER UNITS supply communications at all stations except one, where standby power comes from cold-start diesel unit



TWO GAS TURBINE GENERATORS, each rated for 16,500-kw capacity, were installed in the space between three steam units at Orlando Utilities Commission's Lake Highland Station. They are 2nd and 4th machines from right

Gas Turbine Generators Meet P

Capacity made available quickly at cost of $1.10 per kw; few-hours-per-year operation minimizes fuel rate, noise

F. C. WALLACE, Project Engineer, Black & Veatch, Consulting Engineers, Kansas City, Mo.

The rapid peak-load growth of the Orlando Utilities Commission's electric system and the severity of its short-lived winter peaks prompted installation of simple-cycle gas turbines as new generating equipment. Other factors were:

1. No new plant space was required as the gas turbines were installed in the Lake Highland plant without addition to or extensive modification of the building.

2. No additional operating personnel were required as the two 16,500-kw gas turbines were installed in spaces between three existing steam turbines. All five machines are on the same operating floor level, controlled from a central control panel, and serviced by the same overhead crane.

3. Existing overloaded circulating water facilities were not further

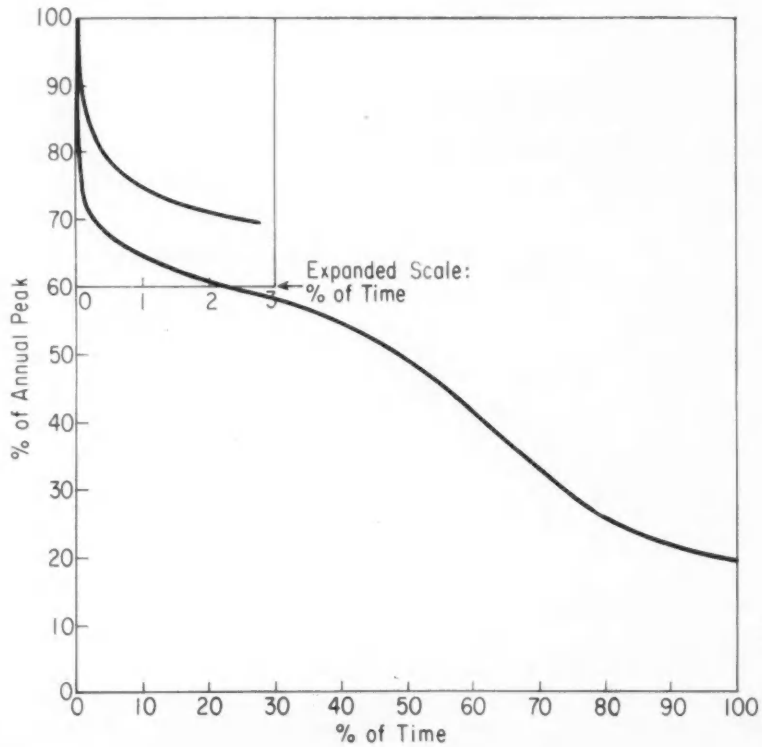


FIG 2—PEAKING UNITS operate only a few hours each year, as is shown by the relationship of the percentage of time that different loads are on the system

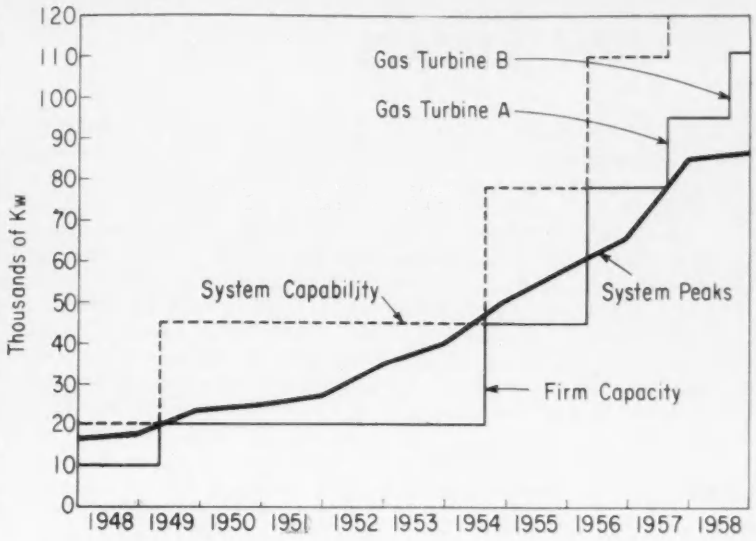


FIG 1—**PEAK LOADS** have grown rapidly between 1948 and 1958, requiring speedy addition to system capacity. For which gas turbines were installed

et Peaking Requirements

taxed, the amount of cooling water for the gas turbines being small.

4. The large overload capacity of gas turbines and their greater efficiency in cold weather make them suitable for December and January system peaks.

5. Their quick starting characteristics (15 to 20 min. from cold standby to full load) make them particularly suitable for the type of standby service required during system emergencies. The advantages of these characteristics were accentuated in a system operating without interconnection.

6. The gas turbines were placed in commercial operation in a short time, thereby materially relieving a critical-capacity deficiency quickly.

7. Various site restrictions, including limited boiler plant space and overburdened circulating water facilities, precluded adding more steam capacity.

As the gas turbine generators are used primarily for standby and peaking service, usually under full-load operation, their poor part-load fuel economy is not a serious handicap. The noise level of the machines is not a serious operating problem. The machines are expected to operate only a few hours each year.

Immediate relief of a critical firm capacity deficiency was made urgent by the system's phenomenal peak-load growth. Despite addition of three new steam turbines, with total capability of nearly 100,000 kw, between 1949 and 1956, to a system generating capability of 20,000 kw as of 1948, a deficiency of firm power was imminent in 1958. The system peak load was actually more than four times the 1948 peak.

The desirability of installing peaking equipment is demonstrated by Fig. 2, which shows the severity of the system peaks, and by Fig. 3, which shows that a very small portion of the energy generated can be attributed to operations during peak periods. The system load is above 75% of the annual peak about 1% of the time, and less than ½% of the annual kwhr are generated at loads above 70% of the annual peak. Thus it was apparent that low-cost, simple-operating peaking equipment was desirable, and that

(*Continued on page* 118)

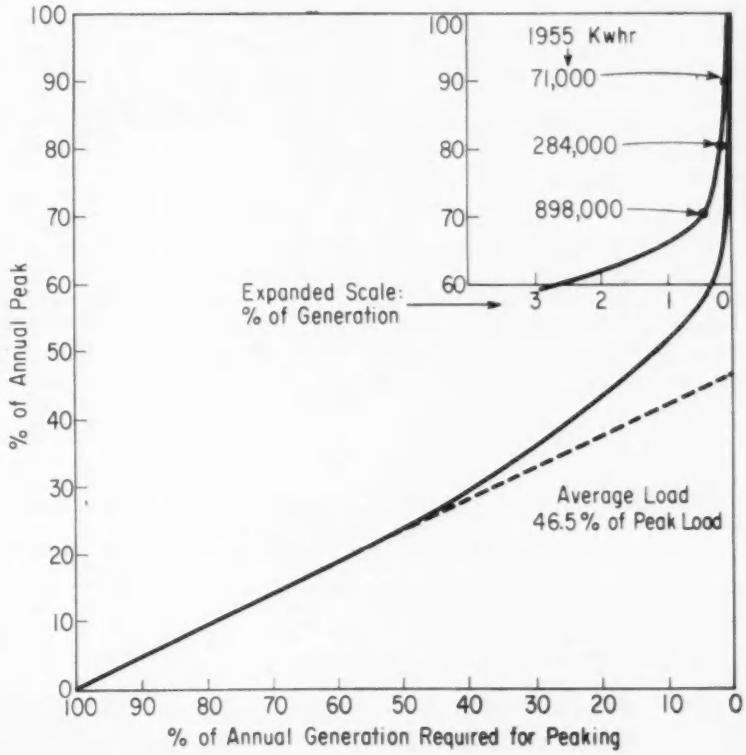


FIG 3—**PERCENT OF GENERATION** required for peaking is high as average load is only 46.5% of peak load. Kwhr generated with peaking units are relatively few

Curves Show Flicker Limits

D. M. SAUTER, Electric Utility Engineer
Westinghouse Electric Corp, East Pittsburgh, Pa.

Voltage fluctuation on an electric utility's constant-voltage system has two causes; utilization equipment, and transient system faults. The first produces lamp flicker; the latter, utilization equipment downtime.

Only the discretion and experience of utility engineers can establish the permissible amount of flicker in a power system serving electric lights. In so doing, engineers must weigh the results of such flicker and so design a distribution system that fluctuation problems are solved within economic boundaries. Industrywide standards are non-existent. Most data on voltage fluctuation limits for lamps are in the form of curves or rules-of-thumb.

The permissible amount of flicker voltage cannot be stated definitively. One person objects to a flicker not perceptible to another. Incandescent and fluorescent lamps change illumination differently upon a change of voltage, and cyclic or rapidly recurring voltage changes are generally more objectionable than non-cyclic. During the latter, annoyance is affected by the rate of change, duration of change, and the frequency of flicker occurrence. These and other factors greatly complicate assignment of limits.

When several persons observe flicker produced by varying magnitudes of voltage dips at a constant rate of repetition, some object to a degree of flicker not even visible to others. In staged tests, observers are more or less biased, as it is next to impossible to judge what anyone's reaction would be to flicker, were he not aware of its impending occurrence and what to look for. Intensity and color of illumination, size and type of lamps, rate of change of voltage, and many other factors also influence flicker perception. Accordingly, flicker limitation is based on compromise.

A survey of limits or standards of all utilities serving more than 100,000 connected customers was made last January. Of the 103 utilities in this class, 98 serve more than 41 million metered customers. The three questions asked and the answers given are in the table at left, below.

Although over 60% of the utilities use limits, only 22% have revised theirs in the last ten years. Although 22 companies have their own curves, only nine are different. Although 59 utilities have voltage flicker limits, there are only 12 different sets of limits. The 12 curves appear in Fig. 1.

As ten curves fall within the heavily outlined area, only their points are indicated. Both remaining curves are recent revisions of the voltage flicker limits of their respective utilities. The curves require interpretation for their use for distribution system analysis and design.

The heavily outlined area in Fig. 1 represents limits used by most of the industry. The relatively

(*Continued on page* 118)

This article on permissible flicker voltage limits is incorporated as part of a chapter in the forthcoming "Distribution Reference Handbook."

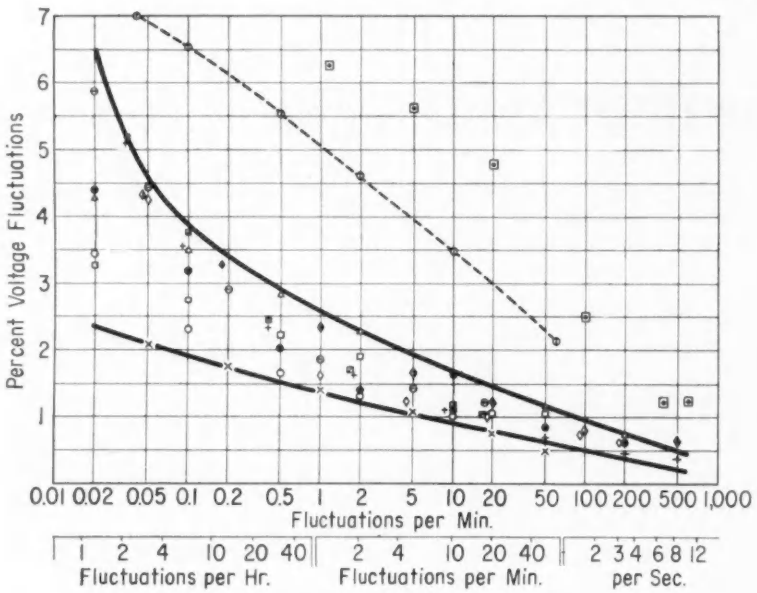


FIG 1—FLICKER VOLTAGE LIMITATIONS in widest use are within heavy curves. Dashed curve represents limits recently proposed, while unconnected points above dashed curve are upper limits two utilities reported in recent EEI survey

Replies from 98 of 103 Utilities Answering Questionnaire

	YES	NO
1. Does your company have established voltage flicker limits?	59	39
2. Do you differentiate between commercial and residential voltage flicker limits?	26	72
3. Have established limits been revised recently?	13	85

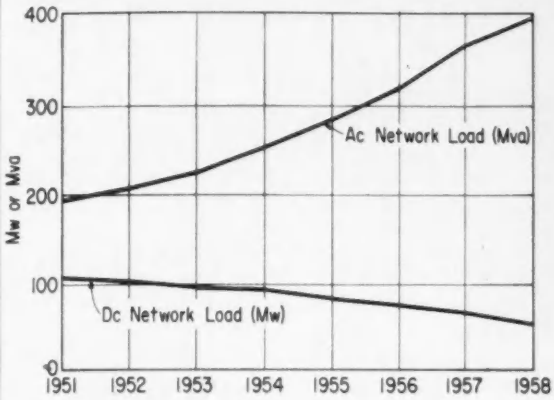


FIG 1—**NETWORK LOADS** have increased while dc loads continue falling off in downtown commercial Chicago

LaSALLE STREET SUBSTATION, once the site of a 5,700-kw dc component, has been re-equipped for ultimate 160-Mva

Squeezes Sites to Get Capacity

Chicago utility replaces 5,700-kw dc substation with 160 Mva one for its ac network

W. T. PRANGE, Engineer, Commonwealth Edison Co, Chicago, Ill.

Rapid ac load growth, gradual decrease in dc loads, congestion of duct space, scarcity of substation sites and new developments in equipment all played important parts in the conversion of Chicago's LaSalle Street Substation from a 5,700-kw dc to a 160 Mva ac substation.

The ac network load in the Chicago Inner Zone increased from 193 Mva in 1951 to 393 Mva in 1958, while the dc load was dropping from 105 to 51 Mw. The drop in dc load resulted from the wrecking of buildings and conversion to other sources of supply, chiefly the ac network system.

The problem of providing adequate capacity for the rapidly growing network load was complicated by the lack of adequate substation sites in the network area. Practically all of the area now supplied by the ac network was once supplied by dc from relatively small dc substations. The substations were supplied by 9 and 12-kv lines from the Fisk Generating Station, about 2½ miles from the load area. The initial supply to the ac network was by 12-kv feeders from the Fisk Station, most of which had to cross the Chicago River to the network area. Crossings were through tunnels.

When the 12-kv facilities at Fisk Station and the conduit runs into the area reached capacity loading, the economical solution was step-down substations within the load area with high-voltage circuits from the generating stations supplying them. A source for high-voltage supply lines to these substations was established at Jefferson Substation, south of Congress Street and west of the Chicago River. The main supply to Jefferson Substation is over 138-kv lines from remote generating stations. In addition, it has two ties to the 69-kv transmission system. Ultimate capacity of the Jefferson sub is 940 Mva. Four 69-kv lines from Jefferson to the 69/12-kv substations in the network area supply as much load as was supplied by 24 12-kv feeders from Fisk Station.

Kingsbury Substation, with initial 69-kv supply from Fisk Station, was installed in 1952. Vernon Park Substation with 69-kv supply from Jefferson was installed in 1954. At these earlier installations, 26.7-Mva transformers and 500 Mva, 12-kv switchgear were installed. The substations were designed for an ultimate installation of four transformers, because:

1. The emergency thermal capability of three transformers approximately equals the normal capability of four transformers (100 Mva).

2. Maximum breaker duty of three transformers operating in parallel approaches 500 Mva, the largest size 15 kv class metalclad air circuit breakers then available.

More 12-Kv Feeders Needed

The 12-kv bus at these earlier installations consists of a sectionalized straight bus closed on itself. Normally, the bus is sectionalized by breakers into two halves, each half supplied by two transformers. When a transformer or associated supply line fails, the bus-tie breakers are closed, and the three remaining transformers are operated in parallel at 12 kv to use their emergency capacity.

Load studies indicated that additional 12-kv feeders would be necessary by 1958 along with more sources of 12 kv supply. At the same time the dc load in the network area was reduced to the point that dc facilities at the La Salle Substation would no longer be required.

An economic analysis of developing several substation sites was made. Of the three locations considered, the LaSalle site was the most economical, chiefly because of its location in the network area and the extensive conduit system in place adjacent to LaSalle.

Economic comparisons of the various sizes of sub-

FIG 2—NETWORK AREA in downtown Chicago, once fed from Fisk Station at 12 kv, is now supplied from several bulk substations as well as from Fisk Station

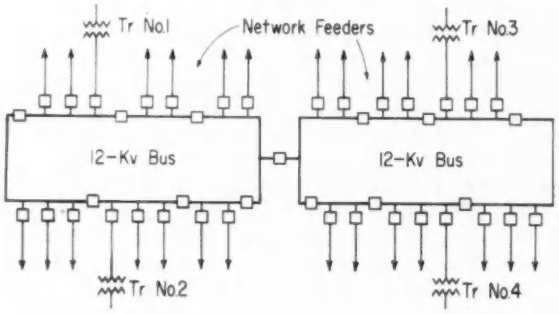


FIG 3—12-KV BUS at LaSalle Substation is in two sections connected by a bus tie breaker. It has one more breaker than a single-bus type in 12 sections

stations indicated that a 160-Mva substation would cost $2.50 per kva less, including transmission supply, than the previous standard 100 Mva size. The increased size was made possible by new developments in equipment. Metalclad air circuit breakers of 750 Mva ratings were available. Increasing the interrupting capacity of breakers by 50% over the former 500 Mva capacity permitted an increase of 50% in transformer sizes without changing the usual procedure of operating not more than three transformers in parallel.

Transformers installed at LaSalle are 3-phase, 40 Mva 66/12.6-kv, FOA with 350-kv BIL. This is Commonwealth Edison's first installation of FOA transformers at a transmission substation. Noise level was no problem because trains coming in and out of the railroad station across the street keep the ambient noise level high. This type of transformer was chosen for its lower cost per kva, smaller size, and lighter weight.

The available conduit system also entered into the selection of transmission supply to LaSalle, just as it did into the selection of the substation site. LaSalle was supplied from the Jefferson Substation at 69 rather than 138 kv because the conduit system did not lend itself to the installation of 3-conductor, 138-kv cable.

Cables supplying LaSalle are oil-filled, 69 kv, 650 MCM, 3-conductor. A smaller size would have been adequate to match the capability of the transformers had it been installed in a conduit with fewer cables, but decreasing the cable size would have reduced the current-carrying capacity of ten or more cables in the same conduit due to duct heating.

At LaSalle the cables are connected directly to the transformers through 3-position (open, close, ground), oil-immersed disconnecting switches. Protection for transformer faults is by remote tripping of breakers at Jefferson by pilot wire relaying.

The bus arrangement at LaSalle, is the first CE Co 12-kv installation with two sectionalized, closed buses connected by a bus-tie breaker. The earlier 100 Mva substations were built with a single closed bus of eight sections.

The LaSalle type of bus requires one more breaker than does a single bus of 12 sections. Cost of the extra breaker was justified on the basis that LaSalle serves only network load, such service requiring high degree of reliability.

A network section supplied from the LaSalle bus is subject to a simultaneous outage of three lines, one line out for planned work and the subsequent failure of a bus-tie breaker, resulting in the loss of two additional feeders to the network section. (Each network section is to be supplied from only one line from each bus section.)

The 750-Mva metalclad air circuit breakers at LaSalle, have interesting features. They have a charged-spring, stored-energy mechanism for closing. This type of mechanism was chosen because on the network system a maximum of 13 feeders must be reclosed simultaneously for network restarting. Battery size and control wiring were minimized by using the charged-spring, stored-energy type of mechanism.

Transformer breakers have blowers, that increase their current-carrying capacity from 2,000 amp, the

(*Continued on page* 118)

You'll find out . . .

Vertical Lift Metal-clad Switchgear's mechanism is up front for easy access

Change places for a moment with the man who maintains your metal-clad switchgear. You'll probably discover you prefer—as he does—to work with General Electric Vertical Lift Metal-clad.

One big reason . . . Vertical Lift is the only metal-clad which has the breaker operating mechanism right up front where it's easy to get at. Unlike designs which locate the mechanism under the contacts, the G-E mechanism can be exposed for inspection in less than a minute. Vertical Lift saves your maintenance crews time, saves your company money. General Electric Company, Schenectady 5, New York. 511-35

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This drastic reduction in maintenance time is purposely designed into Air Blast Breakers. Reason: General Electric realizes that as the quantity of power circuit breakers on electric utility systems increases, maintenance personnel simply cannot be increased in direct ratio.

From 115- through 460-kv, Type ATB Air Blast Breakers need maintenance less frequently because high-pressure air is stored in the interrupter head right at the point of use. Arc transfer from contact fingers to arcing probes is amazingly fast. Arc duration is consistently short, which greatly reduces erosion of the contacts, probes and orifices.

Because the interrupter heads contain all contacts and operating mechanism parts, normal inspection of the breaker is extremely simple:

- Air is exhausted from interrupters.
- Access covers are swung aside.
- Contacts are visible for inspection.

In the event maintenance is required, the entire operating mechanism, weighing only 50 pounds, can be quickly removed and replaced with a spare unit.

A crew of only three men can replace all six interrupters of a 230-kv ATB breaker in less than four hours. Studies indicate that a crew of three or four men take from 12 to 16 hours to maintain a comparably rated oil unit.

There's more to this Air Blast maintenance story. Ask your G-E Sales Apparatus Engineer to tell you the rest. General Electric Co., Schenectady 5, New York. 494-3

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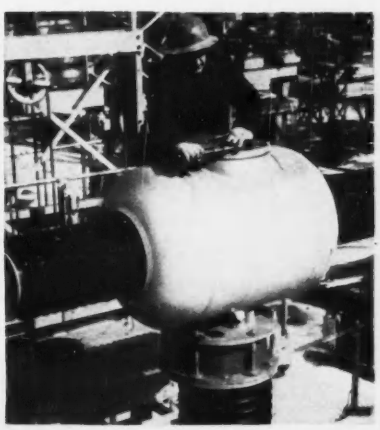
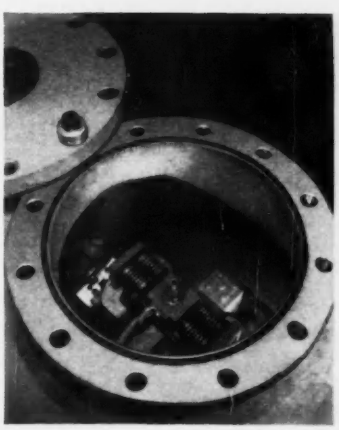
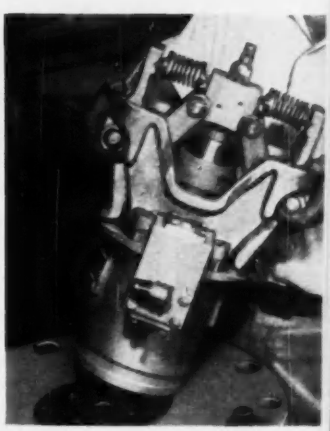
GENERAL ELECTRIC







IN MAINTENANCE SEQUENCE, access covers are easily loosened using standard wrenches; contacts can be inspected without removing any parts. If necessary, the entire operating mechanism can be removed from the interrupter head. Replacing with a spare unit gets breaker back on line immediately.

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Help Fight Inflation, PEA Told

Industry urged by Busby of PP&L to take firm stand behind sound monetary policies; four-point program offered

SAFETY AWARD was presented to W. F. Gilfillan by President Root to honor Duquesne Light Co's safety record. Looking on are, at left, C. U. Thomas, chairman, accident prevention committee, and President-elect W. J. Lyman

It is up to the electric utility industry to help hold the line against inflation, Jack K. Busby, Pennsylvania Power and Light Co, told the annual meeting of the Pennsylvania Electric Association at Philadelphia early this month. "This is the opportunity to speak up on an important national issue," he said.

Four points should be stressed in urging consistent monetary and fiscal management on governmental planners, Busby indicated. First, stabilization of price levels should be a basic policy. The supply of money should be increased at approximately the same rate as the increase in output of goods and services. Federal tax and expenditure policy should be adjusted to achieve price level stability. Finally, a large number of government activities should be re-examined and, in many cases, eliminated. "Inflation," Busby concluded, "is not inevitable."

Allen S. King, president of Edison Electric Institute, noted that the steady growth of the electric industry over the past year served as a stabilizing factor in the entire national economy. During the 1958 recession, he said, the electric industry investment in new plant was $3.8 billion, or 2.3% above 1957, while American industry as a whole fell off 17.4% from the previous year. "Over the next ten years," he predicted, "the electric industry will build and install some 140 million kilowatts of new generating equipment."

The enthusiasm with which private utilities have entered the atomic power field is to be commended, James S. Fairman, Consolidated Edison Co, told delegates while summarizing nuclear activities. Maturity of judgment has avoided a kilowatt race which would have required a helter-skelter expenditure of money with few advantages to either the winner or losers.

"The experience and knowledge which has come from research, development and construction of nuclear power plants are being absorbed by men who will lead the industry in the future," Fairman explained. They will soon add operating experience. This orderly process of assimilation is possibly the most significant and valuable contribution of the past five years to this industry, and to its future ability to serve the nation."

INDUSTRY SUPPORT for sound fiscal policies was urged by Jack K. Busby

Every employee should be an ambassador for his company, said Charles E. Oakes, Pennsylvania Power and Light Co. This requires a wider dissemination of information about company operations and policy. Concurrently, a systematic attempt must be made to increase the number of stockholders in the operating companies, Oakes added.

Current problems of education were outlined by Dr. Millard E. Gladfelter, Temple University. Growing enrollments will place a severe strain on institutions, and care must be taken not to weaken their programs, he said. Dr. Gladfelter expressed the hope that greater use would be made of two-year institutions to train technical assistants.

Clayton B. Hershey, consulting engineer, foresaw a bright future for commercial and industrial applications of electric heating. He pointed out that electric heating is a desirable load for utilities because it balances air conditioning, has a daily peak which occurs earlier than commercial and industrial peaks, improves system power factor, and encourages other uses of electricity.

Pennsylvania utilities once again surpassed the national safety average for the industry. In the PEA annual contest, Duquesne Light Co won a bronze plaque for best results in accident prevention among companies in its class and certificates for two periods of one million

accident-free manhours during the contest period. Philadelphia Electric Co was honored for one million accident-free manhours, as was Pennsylvania Electric Co.

Pennsylvania Power Co had the greatest improvement in its own safety record, 44.2%, while Pennsylvania Power and Light Co had best results in prevention of disabling electric shock and burn accidents.

Among member companies having less than one million manhours exposure annually, awards went to South Penn Power Co and to Home Electric Co for 100% improvements in safety records. Luzerne Electric Division of United Gas Improvement Co received recognition for a perfect record in preventing disabling electric shock and burn accidents.

Association members elected Walter J. Lyman, PEA president for the coming year. Lyman, a vice president of Duquesne Light Co, succeeds A. D. Root of Pennsylvania Power and Light Co. Vice-presidents are G. R. Parry, Metropolitan Edison Co, Park R. Lawson, Pennsylvania Electric Co, and P. M. Alden, Philadelphia Electric Co.

PEA MEMBERS elected Walter J. Lyman president for the 1959-1960 year

3 Factors Focus Attention on Peaking Capacity (*Continued from page 59*)

devices sharpens the fact that considerable work remains in improving quality and reliability of components; and (2) application of control schemes requires greater cooperation between electrical and mechanical engineers.

This call for cooperation was seconded by C. F. Paulus, Cleveland Electric Illuminating Co, who said the AIEE working group should include non-AIEE members to study the remaining 10% of protection schemes that "separates us from the automated power plant."

Evidence indicates that most cases of shell cracking in steam turbines with integral steam chest and nozzle chest design are due to transient thermal stresses, said S. B. Coulter and R. L. Jackson, both of General Electric. Solutions applicable to such turbines are:

1. Stop-valve bypass so that all control valves are open during rolling and initial loading.
2. Starting with low boiler pressure.
3. Starting on existing stop-valve pilot.
4. Special valve cams for simultaneous control-valve opening.
5. Heating of main flange bolt holes prior to and during rolling and loading.
6. Passage of a small steam flow through an inactive bowl during rolling and loading.

The authors pointed out that combinations of these solutions must be used. The stop-valve bypass method combined with adequate instrumentation and steam temperature control seems the most effective step, using automatic recording of essential temperatures as a basis for procedural development.

Turbines experiencing shell cracking are being operated on daily off/on service with weekend shutdowns, said Paul Murphy, Jr, Fred G. Campau, and Homer W. Diebler, all of Detroit Edison Co. They described a satisfactory start-up heating and loading procedure that does not require large steam flows through an enlarged by-pass arrangement as recommended by Coulter and Jackson.

This procedure, applied to an 1,800-rpm, 850-psi, 900-F, 75-Mw turbine, has been used at Detroit Edison to bring a cold turbine quickly up to speed and initial load and to accomplish most of the warm-up on a synchronized unit with control valves wide open.

Three Important Changes

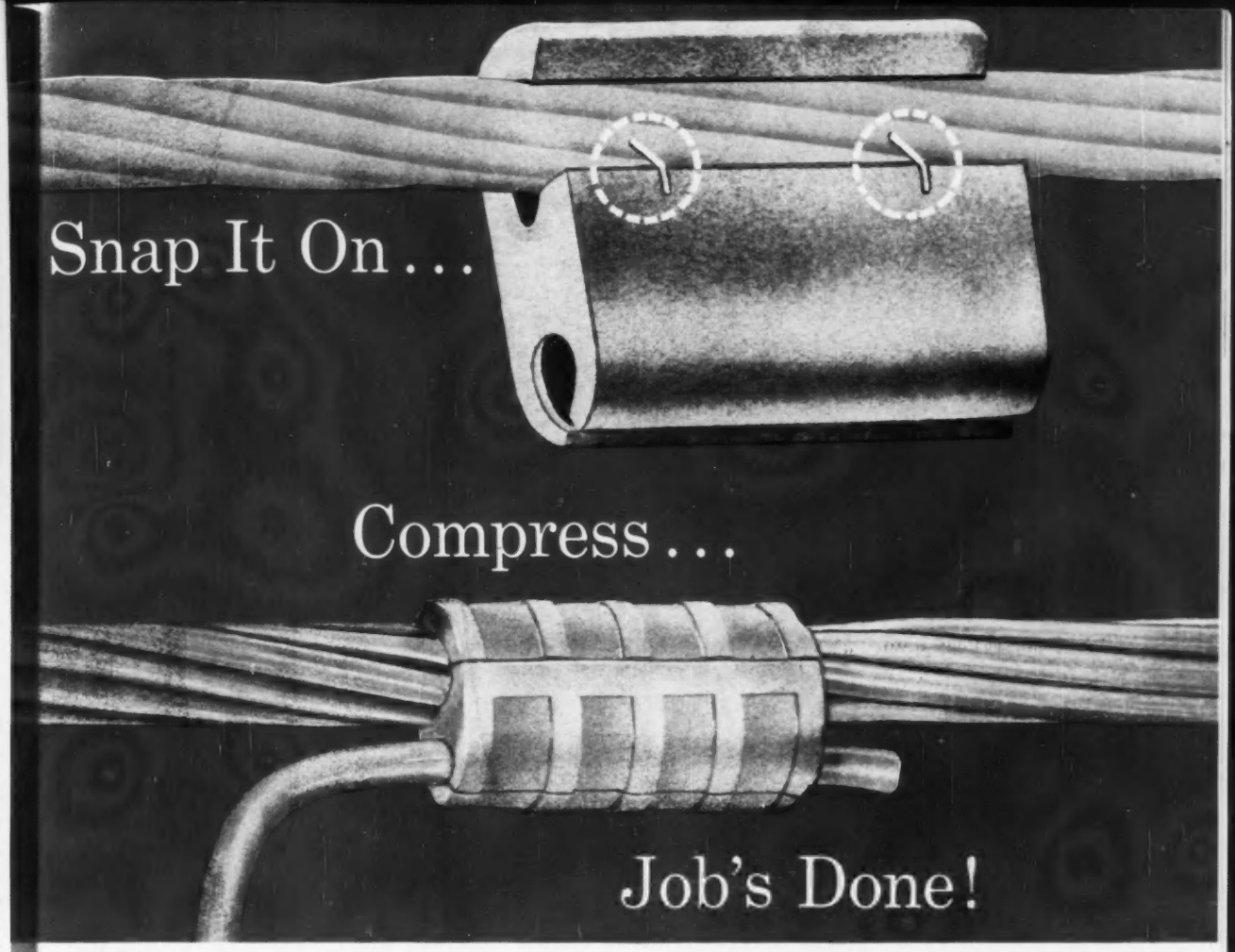
Important in this new procedure are redesign of Nos. 1 and 2 control valve cams; vacuum start-up with all control valves wide open; and heating of the turbine head end with steam 500-600F hotter than the metal temperature. The machine can be loaded initially in about 20 min and start-up time and attention required by operators is reduced considerably. Application of the procedure to turbines of similar design, it was pointed out, requires very little modification.

Changes in turbine efficiency, said F. H. Light, Philadelphia Electric Co, have been detected with simplified plant-performance tests over the past 15 years. Monthly tests on most conventional units require a moderate expenditure for proper instrumentation and a three-man test crew. Higher efficiencies resulting from the tests are worth about $4,200 per unit per year, he said.

The simplified tests have been extended to cover boiler and condenser performance as well. In addition, a study is being made of the economics of using automatic data-collecting devices and digital computation to provide continuous checks for faster detection of changes in efficiency, Light said.

Economics of using high-temperature alloys in superheaters and turbines was touched off by P. M. Brister and G. N. Emmanuel, both of Babcock & Wilcox Co. If the steam temperature is raised from 1,050F to 1,100F, more stainless steel tubes will be required in the superheater, and the outlet header and steam line to the turbine also would be stainless steel.

Regarding use of austenitic alloys in steam turbine design, said N. L. Mochel, Westinghouse, the "austenitic barrier" is one of higher cost, although we have gone beyond this barrier and are gaining experience in the range beyond 1,050-1,000F.



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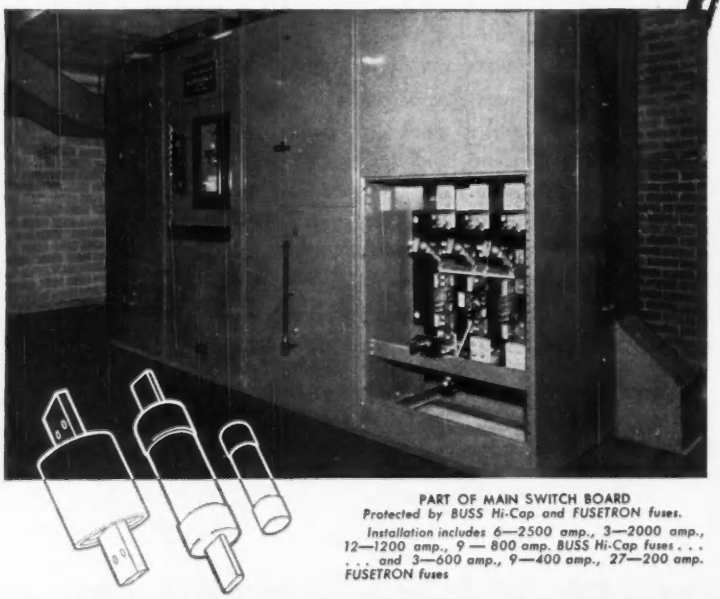

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In this beautiful hospital, tremendous in size, it was found necessary to increase the capacity of the electrical system to meet today's requirements. Modernization of the electrical system resulted in estimated available fault currents of 150,000 amperes.

With faults of this magnitude possible, it became essential that a superior type of protective device be used.

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ANOTHER BUSS HI-CAP AND FUSETRON FUSE INSTALLATION

ARCHITECTS AND ENGINEERS: *Norman F. Six and Elliot C. Fletcher, Tampa and Schmidt, Garden and Erikson, Chicago*

CONTRACTOR: *Miller Electric Co., Jacksonville, Fla.*

WHY HIGH INTERRUPTING CAPACITY IS NEEDED

Fault currents of 75,000 or 150,000 amperes were unheard of a few years ago, — but today they are quite possible. With the generating capacity of utilities increasing yearly, most likely the magnitude of fault currents will be higher in future years.

BUSS Hi-Cap and FUSETRON dual-element fuses have an interrupting capacity designed for today's conditions and to anticipate system growth.

The interrupting rating of BUSS Hi-Cap fuses is 200,000 amperes rms symmetrical — and for FUSETRON fuses it is 100,000 rms symmetrical.

WHY DEPENDABILITY IS NEEDED

With higher fault currents available, the dependability of the protective device becomes of increasing importance.

The protective device should be just as accurate in 10, 15, or 20 years, as it is on the day installed.

A fuse is the only type of protective device to offer this advantage. A fuse must remain safe and accurate, as its operation depends on a simple thermal law. A fuse has no triggers, latches, pivots or contacts to stick or get out of order. Dust, fumes, corrosion or age cannot increase a fuse's capacity or lengthen its blowing time.

for more information

On FUSETRON dual-element fuses - (loads of 0 to 600 amps.) - ***write for bulletin FIS***

On BUSS Hi-Cap fuses - (loads above 600 amps.) - ***write for Bulletin HCS***

1059

BUSSMANN MFG. DIVISION, McGraw-Edison Co. **ST. LOUIS 7, MO.**

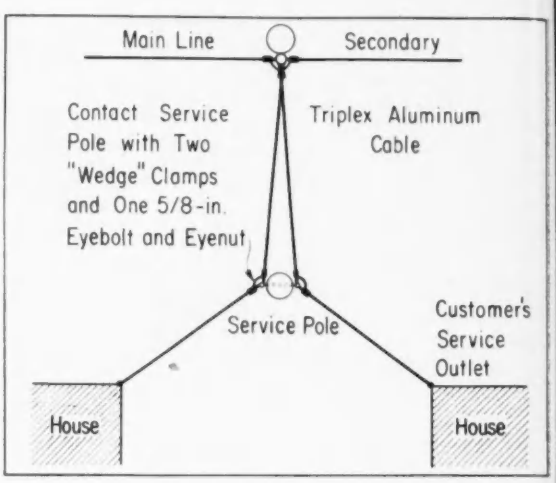
Connection Method Cuts Cost of Services

R. W. HILL, Distribution Engineer, Indianapolis Power & Light Co, Indianapolis, Indiana

Faster service to new customers and lower cost per connection are features of a service connection method devised by Indianapolis Power & Light Co. Aluminum triplex cable is installed in one continuous piece from the main line secondary pole to the house. The cable contacts the service pole through an eye bolt and two wedge clamps in a manner similar to a false dead end.

With this type of installation, service poles can be set on the original main line work order before houses in new developments are completed, thereby allowing time for the pole to settle before any strain is applied. The service cable requires less tree trimming than three-wire secondaries.

The service connection is not strung until the company knows the exact load to be served; thus the proper cable size may be determined. There is less material handling and the connection crew can complete the job on its initial trip.



Cost of material to connect two houses is within $3.00 of the former method. The job now is being done by a two-man connection crew, whereas a small line crew and a connection crew formerly were required. Savings are estimated at about $6.00 per connection; also, customer good will is gained through better and faster service.

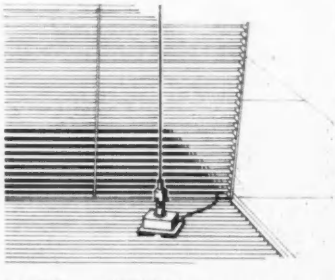
Radio Provides Standby Channel during Tests

PORTABLE RADIO backs up normal telephone communications during the testing of network protectors

J. W. MURRAY JR, Distribution Engineer, Southwestern Electric Power Co, Shreveport, Louisiana.

A walkie-talkie portable radio is used by underground crews in Shreveport to supplement telephone communication during the testing of network protectors. During tests on the protector, it is vital to have continuous contact between the vault and the substation where the oil circuit breakers are located. Continuous contact is maintained by portable telephone over lead-covered communication cable in the ducts.

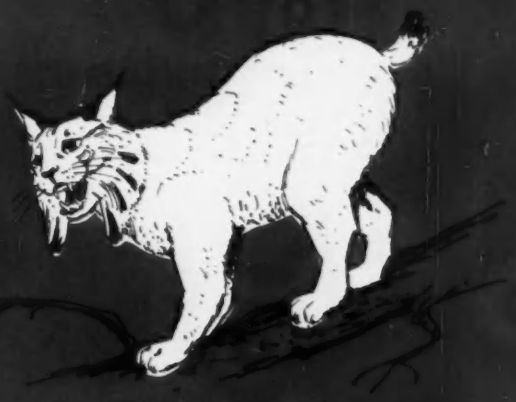
If trouble arises on the telephone cable, the portable radio is at hand for use. To get the radio signals into and out of the reinforced-steel vault, the radio antenna was attached to a base that can be placed on the vault grate. A 30-ft coaxial cable between the base and the radio gives the man in the vault freedom of movement.



RADIO ANTENNA connected to 30-ft coaxial cable carries signals to and from reinforced-steel vault

(*More Methods on page* 78)

Announcing... NEW



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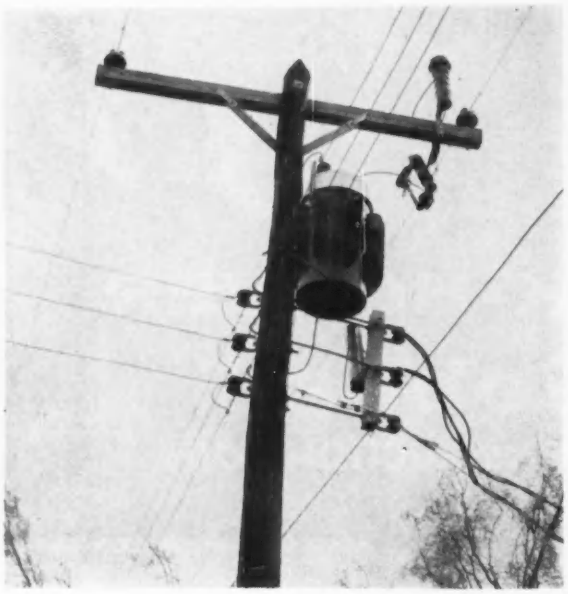
Run Secondary from Bottom of Transformer



Improved appearance overhead and greater safety for linemen on transformer poles have resulted from the use of special transformer secondary connections designed by Public Service Board of San Antonio, Texas. The new design brings secondary leads out from the bottom of the distribution transformer. The arrangement is gaining popularity with construction and operating crews.

In the relocation of the secondary connections, advantage is taken of the recessed bottom of the distribution transformer. The rim of the tank protects the lugs that form the leads from being damaged when the transformer is handled in the warehouse or is being delivered to the transformer pole.

Location of the lugs at the bottom of the transformer has advantages in the field. Work on secondaries and services can be done from below the transformer. Safety of linemen is increased because they do not have to get into the primary area. Furthermore, when work is done on primaries, there is no interference from secondaries. Thus, the bottom-connected design results in better working conditions on the pole.

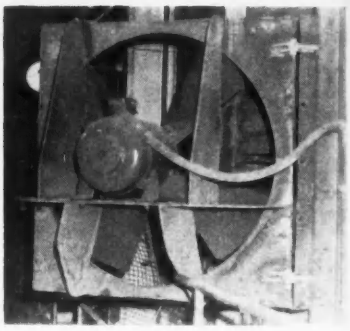
Hinges Simplify Fan Maintenance

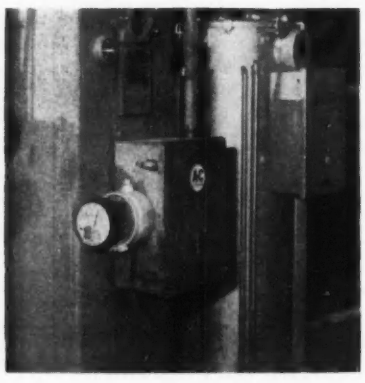
ELMER BOGGS, Maintenance Foreman,
ROY JONES, Maintenance Foreman,
Kyger Creek Station, Ohio Valley Electric Corp, Gallipolis, Ohio

Supporting hinges on ventilating fans simplify maintenance and painting for Ohio Valley Electric Corp. The hinges permit the frame holding the fan motor and protective screen to open like a door and provide easy access to ventilating louvers.

Hinges save about 5 man-hr per fan repair. Cost of adding the hinges was $10 per fan for labor and materials. Standard heavy-duty hinges were welded on.

Formerly, fans were permanently mounted, and the repairman had to remove the protective screen and reach through the fan blading to remove defective louvers. This was unsafe as well as time-consuming.





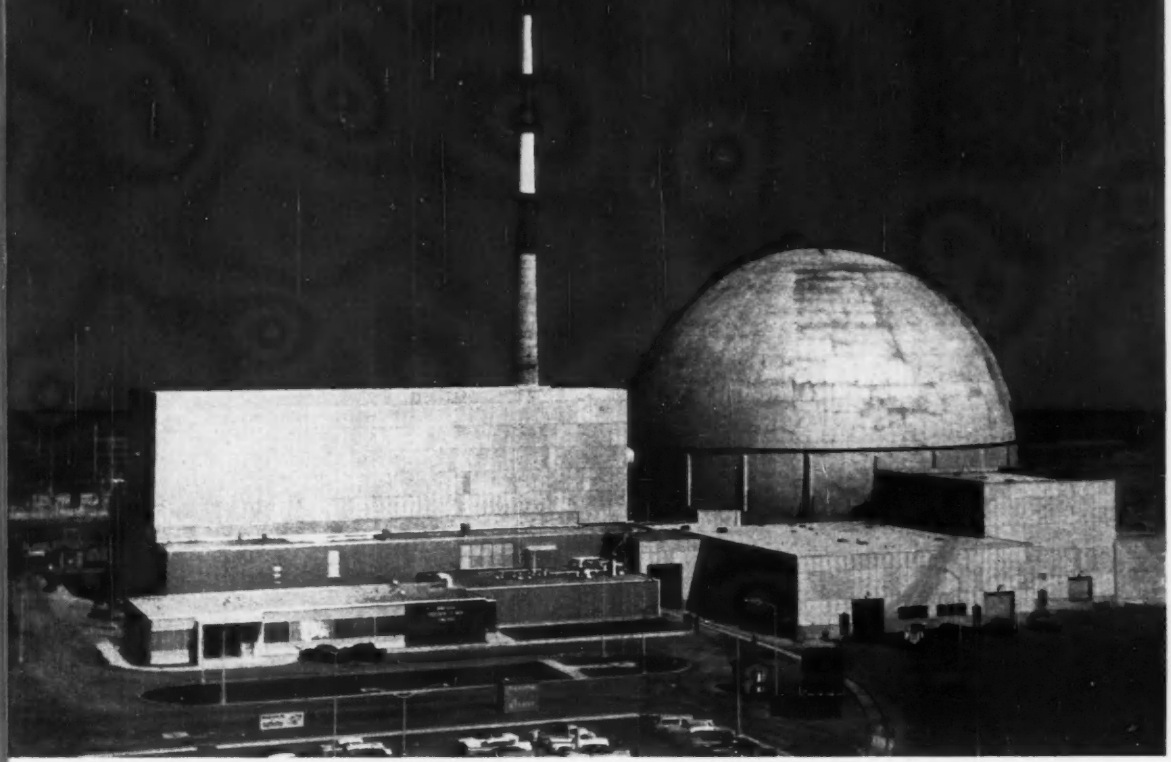
Ammeter Gives Load Data

An economical way of getting load information on substations has been developed by Kansas Power and Light Co. Ammeters are installed on the voltage regulators and connected to the current transformer that provides impulses for the regulators. This saves the cost of installing special current transformers.

Some current transformers on the regulators are of the 5-amp range and others are 0.2-amp range. Ammeters are installed to fit the particular range of current transformer. In some cases ammeters are attached to the voltage regulator; in others, ammeters are mounted on top of the regulator bushings. When the regulators are moved the ammeters go right along with them.

*DRESDEN**

...proves that nuclear power plant costs can be forecast
...will demonstrate the potential of low cost nuclear power



Dresden Nuclear Power Station—America's largest all-nuclear power plant—will be ready for initial test operations by General Electric Company in October, six months ahead of schedule and within original cost estimates. *Owned by Commonwealth Edison Company, the plant is located 50 miles southwest of Chicago.

Construction completion of the 180,000-kilowatt boiling water reactor plant marks an important step in the emergence of nuclear power into full-scale commercial use.

With Dresden proving that nuclear power plant costs can be predicted accurately, Bechtel now designs and constructs nuclear plants on a fixed price basis—*eliminating uncertainty.*

Eight companies comprising Nuclear Power Group, Inc., contributed $15 million toward the total research and development costs: American Electric Power Service Corp., Bechtel Corp., Commonwealth Edison Co., Central Illinois Light Co., Illinois Power Co., Kansas City Power & Light Co., Pacific Gas & Electric Co., Union Electric Co.

As engineer-constructor for General Electric Company, the prime contractor, Bechtel performed plant design, detailed engineering, procurement and construction.

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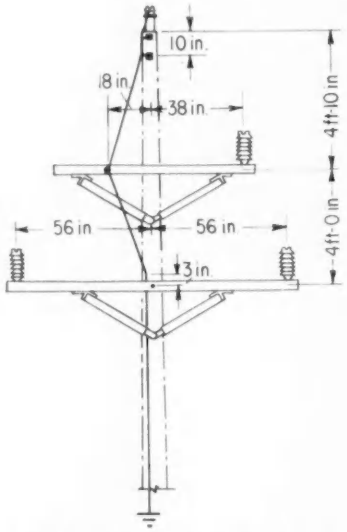
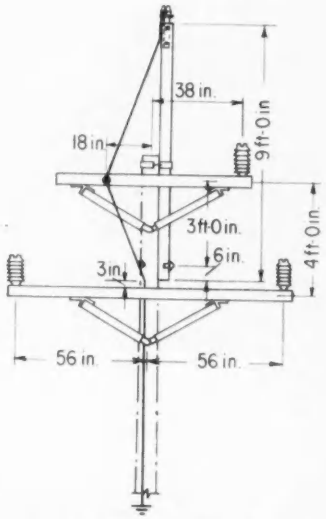
Install Ground Wire on 34.5 Kv

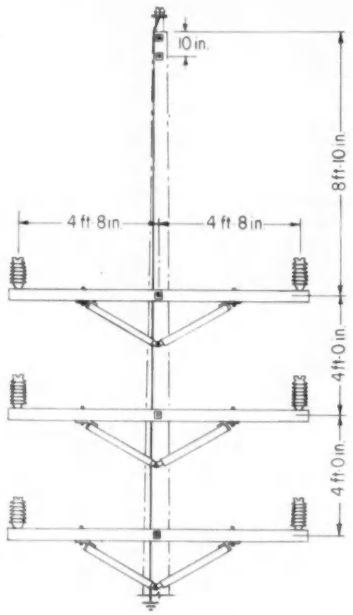
Adapted from distribution standards of the Union Electric Co



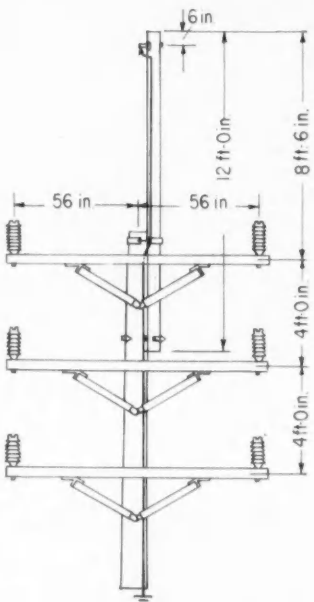
ON NEW CONSTRUCTION sufficient pole height is provided for overhead ground wire. Lead from the ground wire is directed down on side away from conductor



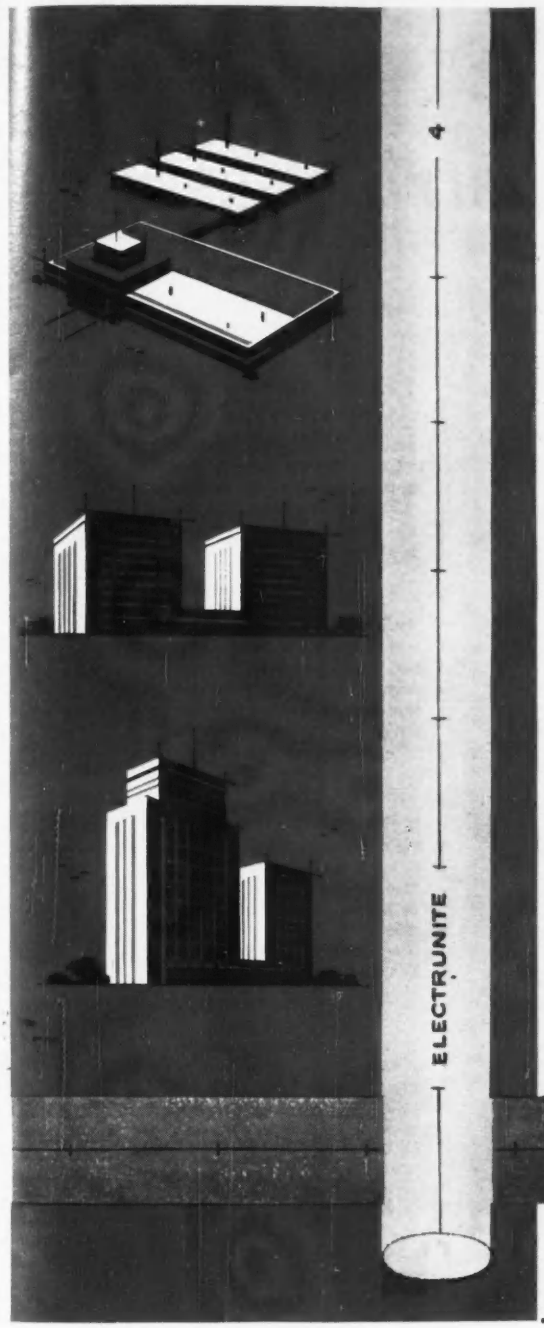
ON EXISTING CONSTRUCTION "bayonets" are installed to provide required height for ground wires. The design shown here is for single-circuit 34.5-kv installations



ON DOUBLE-CIRCUIT LINES no offset for ground wire drop is needed. In both types, copper ground wire is run along pole tops through pin-type insulators



DOUBLE-CIRCUIT existing installation also uses "bayonet" to provide clearance. A separate ground is not required on the 34.5-kv circuit below the ground wire



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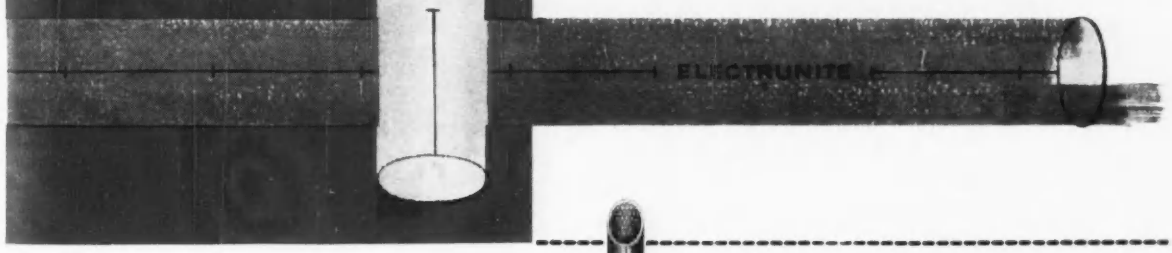

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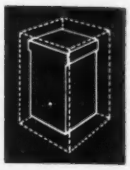
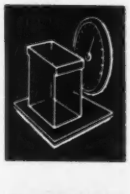
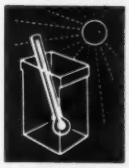
SAVES 30 TO 40% FLOOR SPACE. You can increase your battery room capacity without increasing the room size just by installing new Gould Batteries in Plastrite Jars.



EASIER TO HANDLE. You will find it easier and quicker to move batteries in your battery room; shipping and handling costs are lower because of the reduced weight of these new batteries.



NEW PLASTRITE JARS NEVER LOSE SHAPE . . . never bulge or warp because Plastrite has 15 to 30% higher resistance to heat distortion and 50% higher elongation characteristics than other stationary battery jars.



HIGHER IMPACT RESISTANCE, TOO. Normal handling shocks and shipping abuse will not harm the new Plastrite Jar which has a higher tensile strength.

Defies electrolyte seepage. New Silicone O-ring post seal expands under compression, forming a tight seal against the cover wall of the battery. This prevents escape of electrolyte, eliminates discoloration of battery cover.

New stronger posts assure full current-carrying capacity, permit convenient assembling of cells end-to-end or side-to-side.

New element suspension eliminates cover breakage due to weight of battery element.

Take advantage of the benefits offered by Gould's new Stationary Batteries in Plastrite Jars. They're available in Planté, Calcium, and Kathanode types . . . in capacities for every need. Write today for new illustrated catalogs, or call your local Gould office listed under "Batteries—Industrial" in the "Yellow Pages." Gould-National Batteries, Inc., Trenton 7, N. J.

More Power to you from **gould**

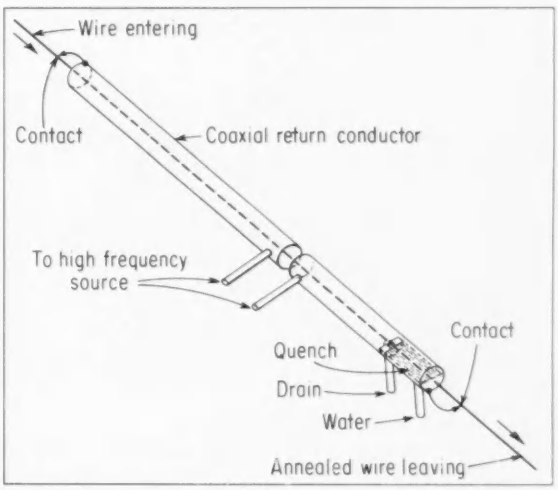
New Wire Annealer Improves Consistency

A new method of continuously annealing bronze wire has speeded up production and improved product quality at the Seymour Mfg. Corp. in Seymour, N. Y. The 25-kw high frequency resistance annealer, developed by the New Rochelle Tool Co., can produce 300 lb of bronze or brass wire per hr and handle sizes from 0.030 to 0.128. Speeds of 700 to 1,500 ft per min are possible.

The annealed wire is free of the nicks or marks produced by other methods. The grain structure differs from that obtained by conventional methods and drawing properties are considerably improved. No scaling or oxidation is produced.

The Thermatool annealer is a complete package unit which includes a 450-kc generator, water condenser, input voltage regulator, wire guiding and feeding device, and an automatic length compensator for changes in wire length during annealing. The 25-kw generator requires only 12 sq ft of floor space and is seven ft high. The length compensator and the guiding and feeding equipment require another 12 cu ft of floor space and are 11 ft high. Using pushbutton control, the equipment can be operated by two semi-skilled workmen.

The 450,000-cycle current is passed directly through the wire, which is heated by the high frequency resistance losses. The wire passes through a feed roll system which guides it vertically through a seven-ft glass-lined metal tube. Current enters the wire at the top and leaves it at the bottom by means of contacts. The lower six inches of the unit is a quenching device which cools the wire before it hits the lower contact and prevents the wire from being marked or nicked. The tube around the wire acts as a coaxial return conductor. Temperature of the wire increases as it passes through the tube, reaching a maximum of about 1,250F.



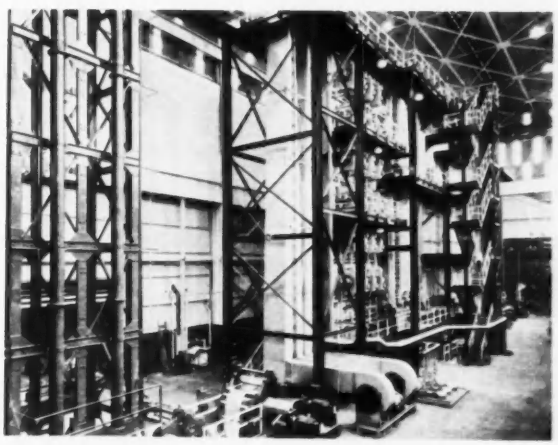
450-KC CURRENT is passed through wire as it traverses 7-ft tube. Quench at lower end cools wire to prevent nicks

The annealer can also be used for any ferrous or nonferrous filament that can be water quenched. Production volume of other metals depends on the annealing temperature. Larger capacity machines are capable of higher production. Because of its compactness, the unit can be installed in a wire drawing line for an interim annealing operation.

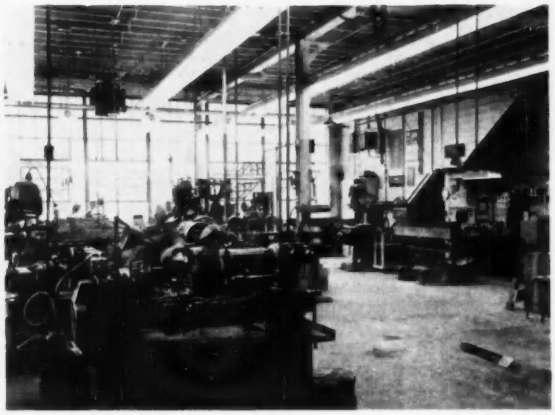
New Continuous Furnace Cuts Process Time 95%

A 934-kw continuous furnace with a new type of cooling has cut annealing time on a tin plate line to 30 min, compared to the 120 hr required by the batch type operation formerly used. In addition, the new unit at Wheeling Steel's Yorkville, Ohio, plant has reduced the length of the cleaning and annealing line by 10%.

Designed to speed cooling of light gage strip, the furnace has 54 motor driven coolers which force cool high velocity gases against the strip to reduce its temperature from 900 F to 250 F. Using only eight passes, the unit has lower installation costs than a conventional 30- to 36-pass water-wall system. Maintaining good temperature control at speeds from 500 to 1,200 ft per min, it has improved the metallurgical qualities. Strip entering the annealer is pre-heated by surplus coke oven gas. The annealing section, where close temperature control is needed, has four separate electric heating zones.



With 100 ft-c in glazing areas . . .



and 200 ft-c in machine shop . . .

Lighting Aids Inspection, Cuts Labor Turnover

SCOTT E. ABELL, Senior Industrial Sales Representative, Ohio Edison Co., Sandusky, Ohio

Improved inspection and a reduction in turnover of highly skilled employees are the results of an extensive relighting program at the Universal Clay Products Co., a manufacturer of insulators and other porcelain products at Sandusky, Ohio. Included in the modernization were the machine shop, the inspection area, the laboratory, and the office.

Work in this plant is highly specialized. Several years training and experience are needed to develop an employee who can turn out a finished product acceptable to the company's customers. With each employee representing a considerable investment in time and money, any reduction in labor turnover represents a considerable gain in overall efficiency.

With illumination in the machine shop at 200 to 220 foot candles, the highly skilled workers now have much better working conditions. Headaches have been practically eliminated since the relighting pro-

Lighting level in the glazing and inspection areas is now 100 foot-candles. This simplifies inspection of both the unfired and finished products and assures a higher quality, more uniform result.

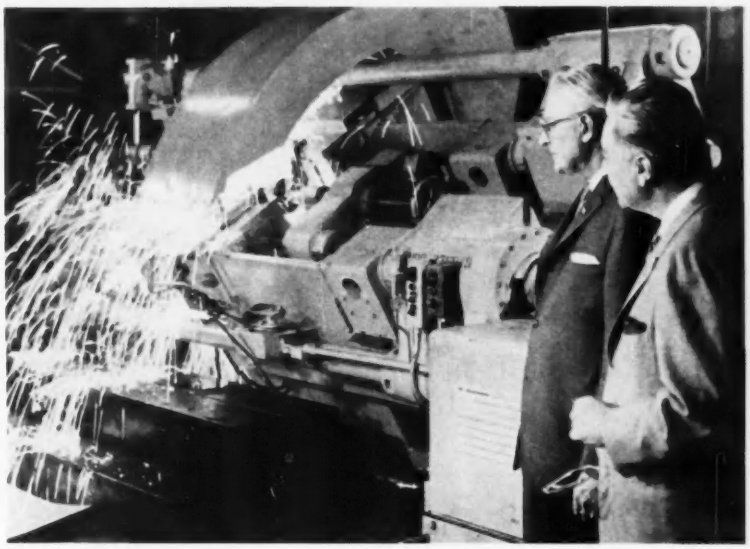
Laboratory Finds Heat Pump Efficient, Economic

OUTDOOR UNIT OF HEAT PUMP exhausts heat and humidity from plant in summer, takes heat from outdoor air in winter

W. E. FREDERICK, Industrial Sales Engineer, West Penn Power Co., New Kensington, Pa.

A 5-ton heat pump is proving itself a practical and economical method of obtaining automatic indoor weather control in a large laboratory building at the Freeport Brick Co., Freeport, Pa. It provides efficient, dependable control, 24 hours per day, winter and summer, for the 900-sq ft building. The unit requires no attention. It fits into an out-of-the-way corner, taking up little valuable floor space. The heat pump is thermostatically controlled to provide heating in the winter and air conditioning in the summer. During the winter, it draws heat from the outside air and to warm the indoor air circulating over the coils. In the summer cooling cycle, heat and humidity are wrung out of the indoor air and exhausted through the outdoor section of the heat pump.

New Welder Saves Time and Money



A new 800-kva single-phase butt-welder that replaces four semi-automatic welding stations is saving time and money for Napco Industries, Inc., Minneapolis, Minn. Used to weld truck axles with 16-inch perimeters, the 440-v machine can make two welds in seven minutes, including set-up time, for a total of approximately 100 welds in an eight-hour shift. The weld is made under a pressure of 100,000 lb. Maximum welder load is 1,075 kva.

Since the new welder places a large and sudden demand on the utility distribution system, some precautions were necessary to prevent objectionable flicker on the services of other customers on the line. Originally Napco was served from two 500-kva transformers fed from a 4.16-kv feeder.

Flicker and load studies were made on a nearby 13.8-kv line. These indicated that the new welder could be served adequately from this line without objectionable flicker. The 13.8-kv line was extended to serve Napco. A 13.8/277-480-v pad-mounted substation, comprising two 750-kva 3-phase transformers, was built near the plant to serve the welder and 300 kva of associated motor load.

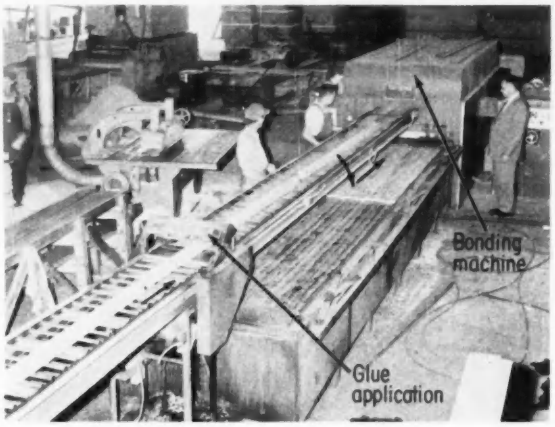
Foresight Means Good Sight For Bearing Co.

WES HICKCOX, Industrial Sales Engineer, Connecticut Light & Power Co., New Britain, Conn.

To stay competitive in today's economy, any manufacturer must keep his facilities in pace with new techniques. But the really progressive company is the one that stays ahead of the crowd. Look at the modern lighting facilities in the Fafnir Bearing Co.'s plant at Newington, Conn. Although installed three years ago, this lighting meets the new standards released last year. Twin-lamp fluorescents maintain 50 foot-candles on the work surfaces. Glare and deep shadows are non-existent. And good maintenance has kept lighting up to the design level.

What's Your Production Problem?

If you have problems in lighting, drying, casting, forging, painting, or materials handling, consult your local power company. Let their experienced specialists show you how to cut costs with electric power.



Turning odd-sized boards . . .

into strong, useful panels . . .

Dielectric Bonder is Key to New Product

HOMER H. TURNER, JR., Industrial Power Engineer, Alabama Power Co., Birmingham, Alabama

A new product, a new market, and a practical use for what was once scrap material – these are the benefits obtained from a new dielectric bonding machine recently installed at the W. A. Belcher Lumber Co. in Birmingham, Ala. With a electrically heated bonder, odd-sized boards can be glued together to form wooden panels up to four ft wide and 16 ft long. Belcher can also make special sizes to fit specific needs.

The easy-to-handle panels are much stronger than a comparable thickness of plywood and are rapidly becoming popular with contractors, builders, and "do-it-yourself" enthusiasts. The number one grade is suitable for inside panelling; the number two grade, for subflooring, storm sheeting, and decking.

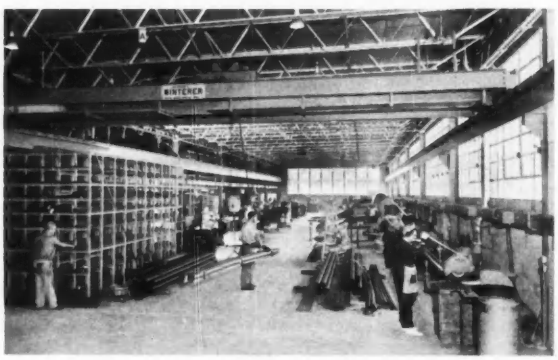
Before the bonder was installed, boards three ft or longer were used to make lath. Boards shorter than three ft were unusable. The glue used in the panels is so strong that the wood itself will break before the joints separate.

The boards are placed on a conveyor and carried through a mechanical glue applicator which coats both edges with glue. The conveyor then carries the boards to the bonding machine. Here the operators remove the boards and place them, glued edges together, on a second conveyor feeding the bonding machine.

Inside the machine, the boards are pressed together from the sides, assuring a light contact between the glued edges. The top press forces the boards down onto the conveyor and dielectric heat is applied for 40 sec.

When the presses are released, the conveyor moves the panel out of the machine. After an inspection, it is run through a surfacer and double-end trimmer.

Electric Crane Cuts Materials Handling 75%



L. ALBERTSON, Sales Applications Dept., Philadelphia Electric Co., Philadelphia, Pa.

An electric overhead travelling crane has helped bring about a 75% reduction in materials handling time at General Machine Products Co., Inc., Trevose, Pa. With the crane, incoming loads of steel can be picked right off the truck bed, at an indoor loading dock, and transported either to steel storage racks or to any of 20 machines. Steel can be moved from the stockpile to the machines in the same quick, efficient manner. Two 5-hp motors are used for the traversing mechanism, one for the lifting operation.

Passes even the "white glove" inspection– Thanks to Dowell's new standard of cleanness

You may never have occasion to place "white glove" requirements to the cleanness of your process equipment, steam generators, tanks and piping. But, if you do need this high degree of cleanness, Dowell can now offer it — as an additional service — in the chemical cleaning of *your* plant equipment.

Dowell developed these new standards in cleaning the piping networks of the missile launching facilities at Cape Canaveral. Combining the research and engineering facilities of the entire company, Dowell perfected new techniques, materials and equipment to meet the necessary rigid specifications.

This new service is now adaptable for use in all types of American industry. For example, Dowell recently performed an intricate cleaning job on a 3½-mile-long buried pipeline. The customer wanted to convert the six-inch line from hydrocarbon gas to carry oxygen. For this pure product the line had to be immaculate—free of all foreign materials. The plant was faced with the alternate of laying new pipe—a six week job at a cost of $150,000.

Using their new standard of cleanness, Dowell cleaned the line of hydrocarbon residues, carbon black, grease, mill scale, and rust. Meanwhile, plant crews made mechanical alterations to the line at a cost of about $25,000. Dowell's charge was $20,000; the job was done in 3½ days.

The job was satisfactory in every way. Inspection showed the line was free of all foreign matter. The customer credited Dowell with saving them about $100,000. Also the plant made additional profits because the line was put back into use so quickly.

Ask your Dowell representative about these new standards of cleanness and their possible application to your problems. This exclusive Dowell service may save you important money. Dowell, the pioneer of chemical cleaning, has 165 offices to serve every major industrial center. Dowell, Tulsa 1, Oklahoma.

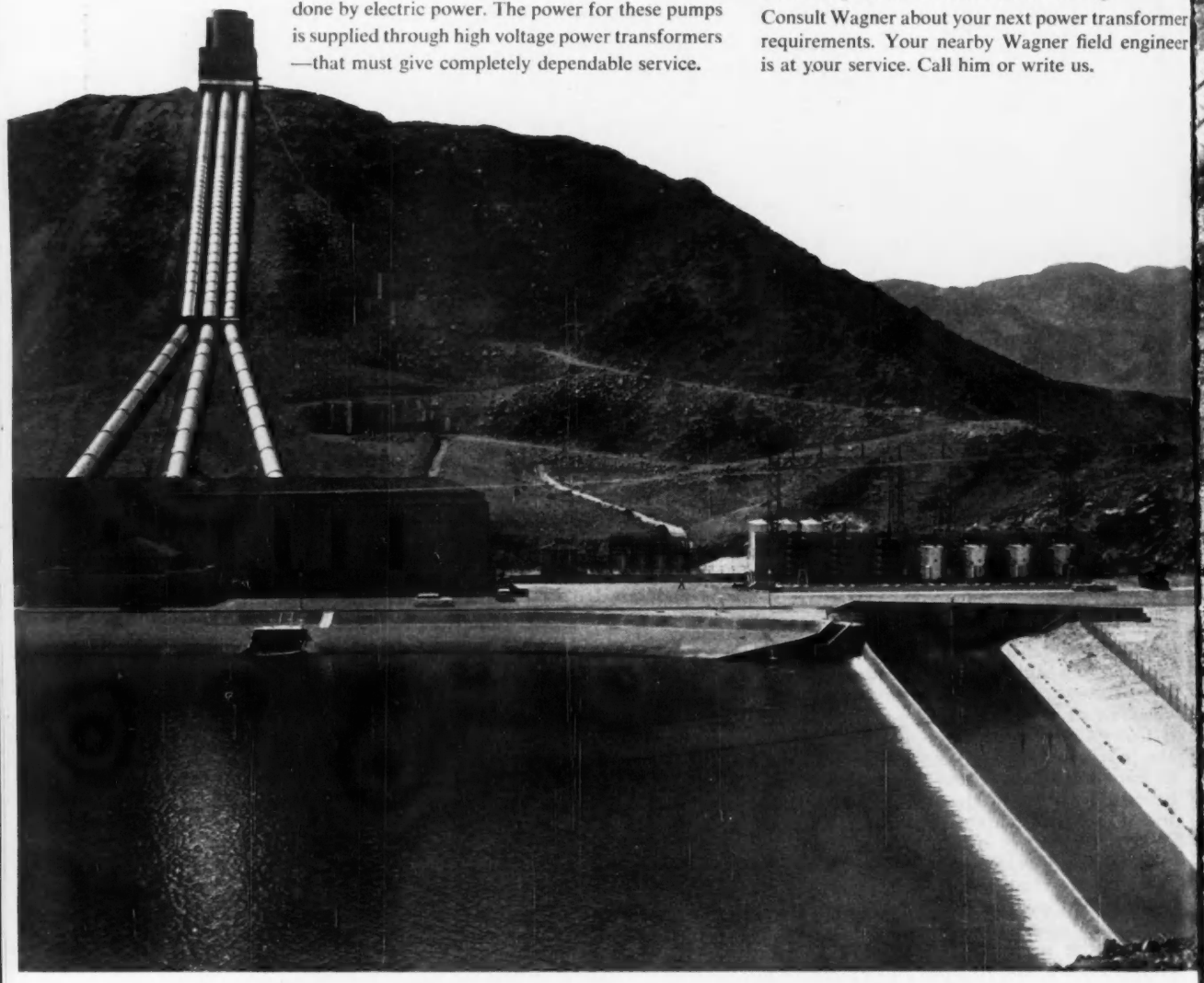
Chemical cleaning service for all industry DOWELL
DIVISION OF THE DOW CHEMICAL COMPANY

TEN 230 KV WAGNER POWER TR
DOUBLE CAPACITY OF SOUTHERN CALIFORNIA W

The Metropolitan Water District of Southern California extends into five California counties, and has a population of 7,000,000 people. Water from the Colorado River is carried by the District's aqueduct across the entire state of California through an aqueduct system 654 miles long. Pumping stations along the aqueduct lift the water 1617 feet over mountain barriers—a tremendous job, done by electric power. The power for these pumps is supplied through high voltage power transformers —that must give completely dependable service.

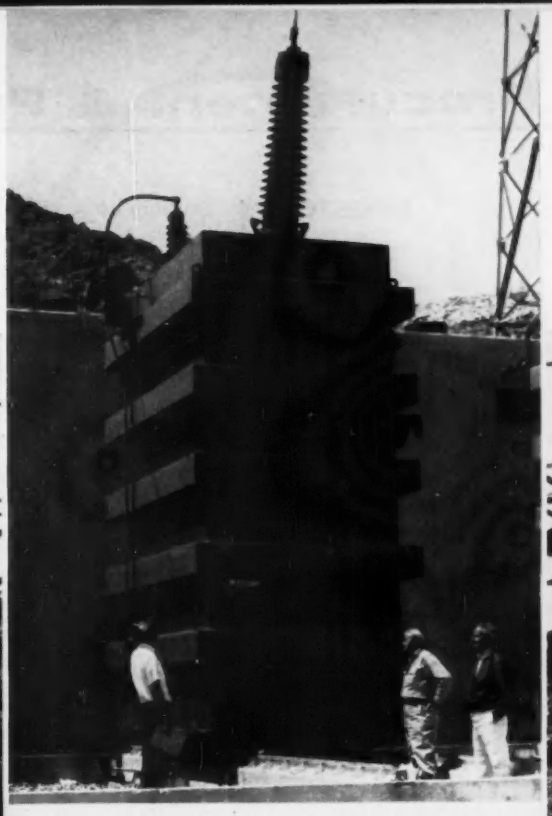
To fill the need for more water, the Metropolitan Water District recently installed ten Wagner 230,000 volt power transformers at three of the pumping stations along the system. Three of these transformers are rated 5500 kva—seven are rated 15,000 kva. They will help supply enough power to double the capacity of the system. The transformers are oil-immersed, water-cooled, with an alternate provision for forced-oil cooling.

Consult Wagner about your next power transformer requirements. Your nearby Wagner field engineer is at your service. Call him or write us.



MORE WATER FOR SOUTHERN CALIFORNIA is boosted over a mountain barrier at the Iron Mountain pump lift through three huge pipes, some 10 feet in diameter. Ultimately a billion gallons of water per day will be lifted through this pumping station.

TRANSFORMERS HELP WATER SYSTEM



One of the three 230 kv Wagner Power Transformers added to the Eagle Mountain pump lift.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6456 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

SERVING 2 GREAT GROWTH INDUSTRIES . . . ELECTRICAL . . . AUTOMOTIVE

WT59-12

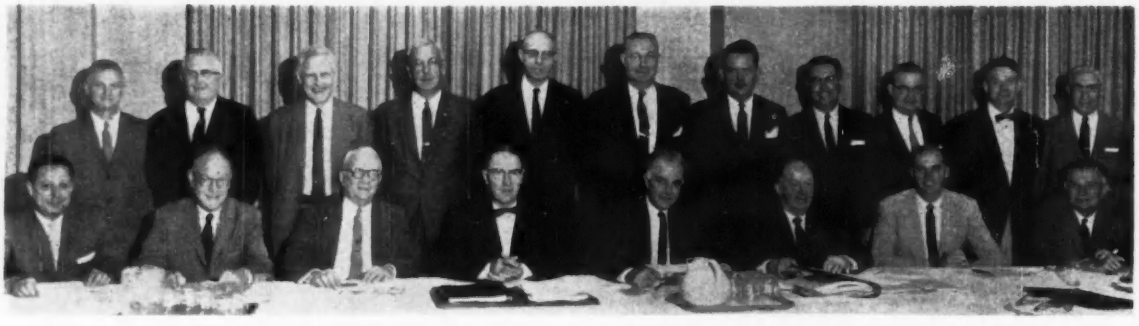
INVENTORY ▶ **Buyers hope to hold to an orderly but steady pace** in rebuilding inventories depleted by the steel and copper strikes. Survey results reported last week by the National Association of Purchasing Agents and the magazine, Purchasing Week, indicated that purchasing agents will do their best to avoid a mad scramble of buying to rebuild inventories once the metal workers resume production. The surveys, covering a broad segment of the purchasing fraternity, show that the strikes are the number one problem of PAs and are beginning to cause dislocations in some industries. But the Purchasing Week survey showed that sizeable inventory buildups are being planned for early next year.

FLY ASH ▶ **Top grade fly ash is netting 50¢ per cubic yard** to Connecticut Light & Power Co—a gain of $1.30 per cubic yard for the utility which formerly paid 80¢ a ton to dispose of this worrisome material. F. M. Reinhold, vice president of purchasing, reports that about 25% of the ash from the 600,000 kw Devon Station is being sold. Most of this is electrostatically collected.

A promising market for the top grade fly ash is the concrete block industry. The ash is mixed with lime to form a patented mixture known as "Poziment" which has chemical characteristics similar to cement. This is used to replace a part of the cement in building blocks. Connecticut L&P has also fostered use of the fly ash for ready mix concrete for roads.

A centrifugal separator for removing lower grade ash is being developed by contractors working with Connecticut L&P.

TIME SAVER ▶ **Time-saving idea for storekeepers** is a small item "smorgasbord" where linemen and servicemen can help themselves to small exempt items. One is in use at the Attica District storeroom of the Public Service Co of Indiana.



UTILITY BUYERS PLAN 1960 MEET on theme of "Tomorrow's Problems Today." The mid-winter conference will be held at the Biltmore Hotel in Atlanta, Ga., Jan. 31, Feb. 1 and 2. Pictured above are members of the executive committee who attended preliminary planning sessions in Atlanta recently. Chairman of the Public Utility Buyers' Group is Joseph B. Homsher, Gilbert Associates. First Vice Chairman is Robert B. Gear, Commonwealth Edison Co, Chicago

New

"D" COATING

adds life to strand

...even in highly corrosive atmospheres

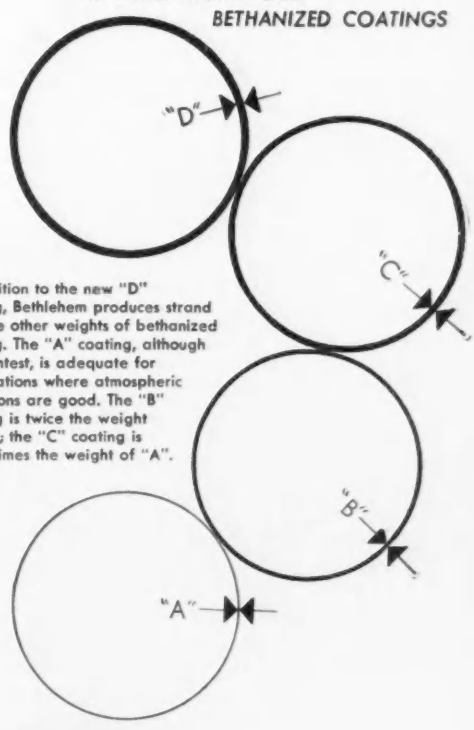
Bethlehem strand with the "D" bethanized coating has a tightly bonded zinc armor that's four times heavier than the economical "A" bethanized coating. Bethlehem's "D" coating, of 99.9 per cent pure zinc, is applied to the strand wires by our unique electrolytic process. Not only is the coating ductile, but it is also completely uniform in thickness.

If you have any questions about Bethlehem strand, or its four weights of bethanized coating, the nearest Bethlehem sales office will be glad to talk them over with you, or write us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

CHOOSE FROM FOUR BETHANIZED COATINGS



In addition to the new "D" coating, Bethlehem produces strand in three other weights of bethanized coating. The "A" coating, although the lightest, is adequate for applications where atmospheric conditions are good. The "B" coating is twice the weight of "A"; the "C" coating is three times the weight of "A".

BETHLEHEM STEEL

CEMA Holds Fifteenth Annual Meeting

Canadian electrical manufacturers elect Wilcox new president; announce better sales, poorer profits; hear about Ontario Hydro's "selling campaign".

G. L. WILCOX

W. I. TURNER

The Canadian Electrical Manufacturers Association held their fifteenth annual meeting in Niagara Falls, Ontario, Sept. 30 to Oct. 2.

George L. Wilcox, president of Canadian Westinghouse, was elected president of CEMA for the coming year. Mr. Wilcox predicted that 1959 would be the third best year in history for electrical manufacturers' sales, with 1960 showing even more improvement. But he pointed out that with profits dropping to 2.9% of the sales dollar, and imports rising to 30% of the industry output, there was, more than ever, need to "Buy Canadian."

Retiring CEMA president W. I. Turner, president of Canadian Controllers, Ltd., told a news conference that considerable optimism was justified as to the Canadian market for electrical home appliances in the first half of the 1960's. He cited the "war babies crop" approaching marriageable age, obsolescence of old appliances, and the sale of "growth products" such as dishwashers, freezers, and automatic washers and dryers.

Concerning electrical living programs, Mr. Turner said that two broad programs emerged this past year. One, the Plantpower Program, covering all industrial electrical products, was designed and tested. The other, The Medallion Home Promotion, approached full dimension in its second year of operation. Both of these will continue and expand over the next few years, Mr. Turner said.

And he predicted that CEMA's Electrical Bureau of Canada will promote more specialized programs such as Electric Space Heating, Commercial and Institutional Modernization, and the Appliance Promotion Calendar.

Closer cooperation between CEMA and the Canadian utilities has helped in the promotion of these programs, Mr. Turner pointed out. "There is a free exchange of personnel on committees and conferences; wider use of common slogans and symbols; freer exchange of top-level ideas," he said. And he cited Electrical Service Leagues for their "outstanding progress" in a number of promotional fields.

In the field of electric space heating, Mr. Turner felt that it was fully feasible in medium-priced homes today. But he also pointed out that in the future the greatest impact might be on low-priced homes. And he foresaw that within ten years one third of the housing starts in Canada might incorporate electric heating, providing that electrical authorities in Canada promote electric heating on a continuing basis as Ontario Hydro is now doing.

Main speaker at CEMA's annual convention was J. S. Duncan, chairman of the Hydro-Electric Power Commission of Ontario. Mr. Duncan described to CEMA members what Ontario Hydro was doing to promote the use of electricity. Among the points he mentioned:

- The "Live Better Electrically" program has been carried out in conjunction with municipalities at a "cost of one and a quarter million dollars and has met with impressive public response."
- Electric heating is "one of the most important new aspects of electrical use in Ontario. Last year, Ontario Hydro instituted new rates for heating by electric energy. A spot check of the province showed that, as of June 1st of this year, 50 domestic and 33 commercial installations had been completed, the latter including schools, churches, motels and office buildings. At that time, 285 electrically-heated homes were under construction, and some 2200 inquiries were received from persons interested in it for proposed new homes."
- Hot water heating: Though there is stiff competition, Ontario Hydro has had "encouraging results" from a recently-instituted heater rental program to rural customers.
- Electrical appliances have been supplied free of charge to home economics classes in Ontario schools.

(*More Manufacturers News, p* 94)

IBM adds another volume to a growing library of programming

New Commercial Translator can save you more than 50% of your programming cost.

All automatic programming for the tasks of data processing has one common goal—a universal language that would eliminate all problems of conversion. Toward this goal IBM has contributed many major milestones. To name just a few:

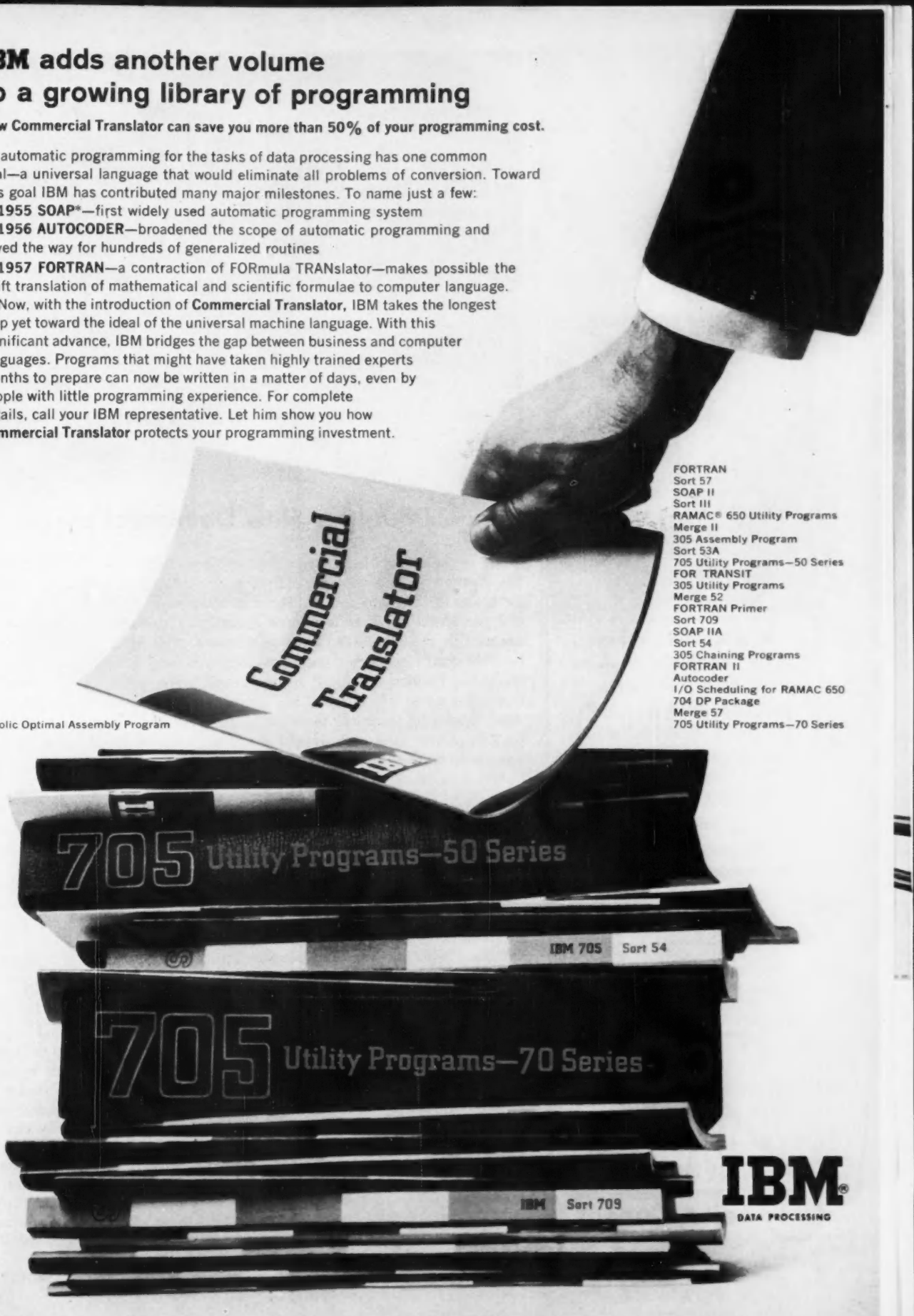
1955 SOAP*—first widely used automatic programming system

1956 AUTOCODER—broadened the scope of automatic programming and paved the way for hundreds of generalized routines

1957 FORTRAN—a contraction of FORmula TRANslator—makes possible the swift translation of mathematical and scientific formulae to computer language.

Now, with the introduction of **Commercial Translator,** IBM takes the longest step yet toward the ideal of the universal machine language. With this significant advance, IBM bridges the gap between business and computer languages. Programs that might have taken highly trained experts months to prepare can now be written in a matter of days, even by people with little programming experience. For complete details, call your IBM representative. Let him show you how **Commercial Translator** protects your programming investment.

*Symbolic Optimal Assembly Program



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DATA PROCESSING

END
TREE-TRIMMING
PROBLEMS

By using aerial (field spun) cable for distribution lines, practically all tree-trimming is eliminated during the installation and for the rest of the cable life.

The freedom from maintenance experienced with this type of installation makes it a very economical distribution plant.

★ ★ ★

For descriptive literature on tools for spinning aerial cable, write or phone

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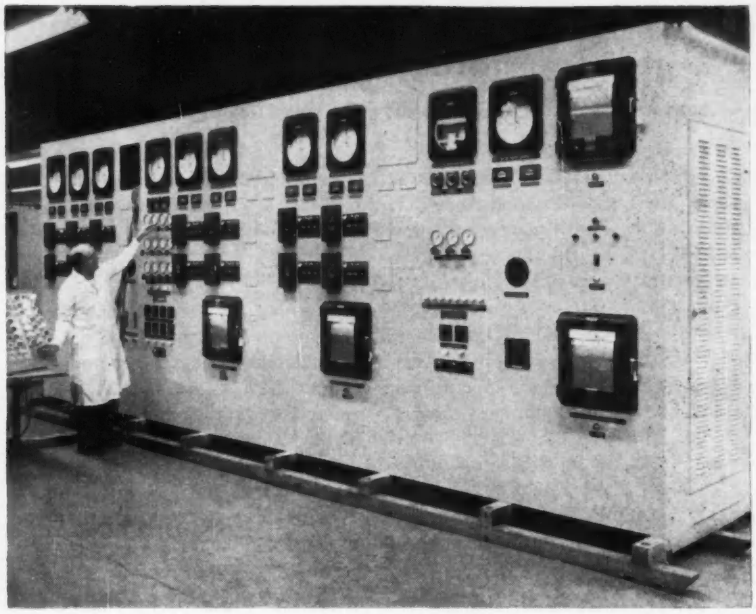
Phone CE 2-7234

CABLE SPINNING EQUIPMENT CO.

Topeka Kansas



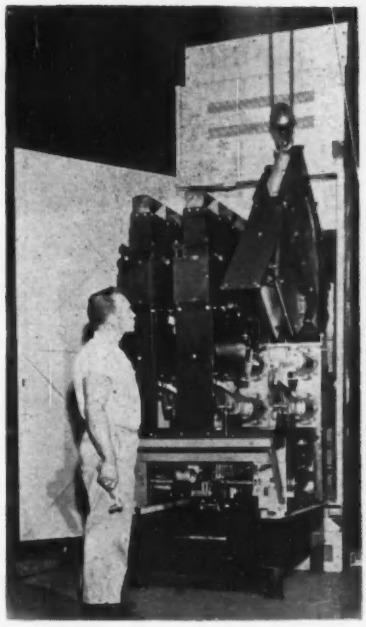
Bogue Develops New Demineralizer

An automatic demineralization system, controlled by one technician, has been developed by the Belco division of Bogue Electric Manufacturing for use in steam power plants. Heart of the system is an automatic control panel that contains the nerve center of a demineralization system designed to provide 2500 gallons per minute. The panel (shown above) is of the dead front, free standing, walk-in type, and controls seven cation units, one vacuum deaerator, six weak base anion units, and six strong base anion units. The operator has "complete control of the entire system" at his fingertips, according to Bogue. All service flow rates are recorded on flow meters used exclusively for that purpose. And all regeneration flows are recorded separately, providing a permanent record of all flows.

MANUFACTURERS BRIEFS

Moloney Electric sets up advanced design engineering group to plan, conduct, and consolidate an advanced program for power transformers. Some of the numerous projects to be undertaken by the group include intense investigation in the scope of heat transfer and insulation . . . **Alcoa** wins $1,690,000 contract from the New York Power Authority to supply ACSR conductor for the 145-mile, 345-kv transmission line from the Niagara hydroelectric plant to Syracuse. The contract was awarded on a negotiated basis after Alcoa and the three other large aluminum producers had submitted identical bids of $1,708,240.72 . . . **General Electric** will build $1-million silicon rectifier power conversion system for Olin Mathieson's Niagara Falls plant. 27,000-kw system will supply 100,000 amps for the operation of chlorine-caustic cells . . . **Mead-Morrison** will build 1250-ton-per-hour travelling coal-unloading tower for Commonwealth Edison . . . **Federal Pacific's** June 30 fiscal year sales are up 14% to $62,724,709; net is down 15% . . . **Burndy** teams up with British Insulated Callendar's Cables, forms company to manufacture and sell Burndy electrical connectors in the British Commonwealth . . . **C & D Batteries, Inc.** is sold to Electric Autolite to operate as a division. No changes in personnel, management, or field representation of C & D

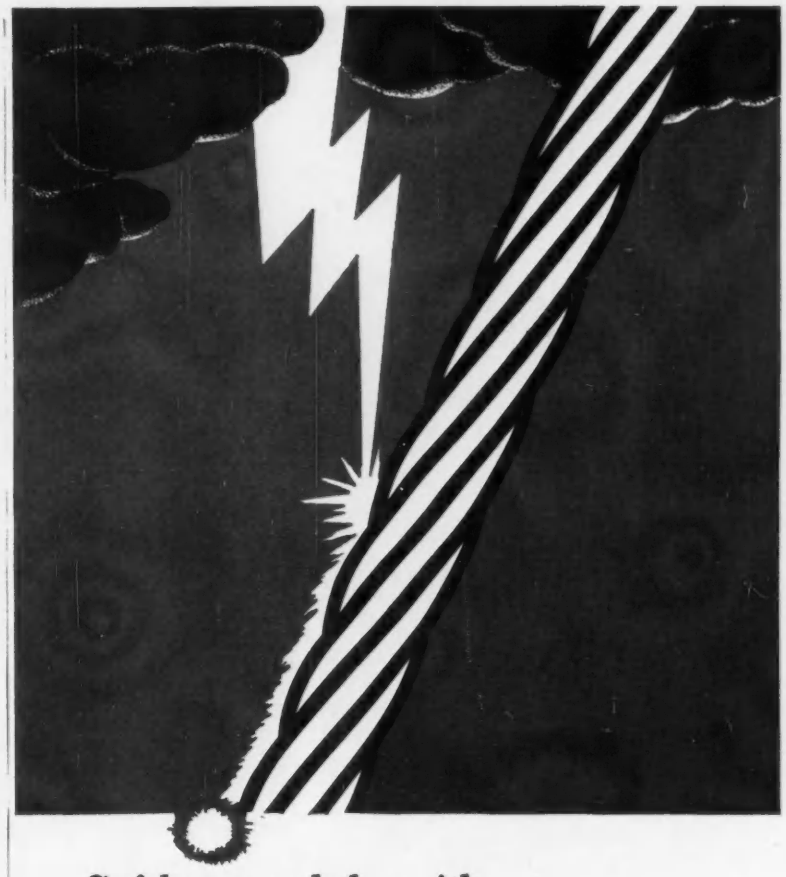
"are contemplated" . . . **General Electric's** Glenn B. Warren, vice president and consulting engineer for the turbine division, says gas turbine-generators will have an important place in overseas markets, filling the niche between diesel engine generators and large steam turbine-generators . . . **The Russians** claim they have tested successfully their first 300-Mw generator with a water-cooled stator and a high-pressure hydrogen-cooled rotor. They also say they are designing a 200-Mw unit using a liquid-cooled rotor . . . **Swedish** cable manufacturing firm is conducting tests on rats to determine what kinds of cable insulation they do and don't like to chew. So far, the researchers have found that only cables with metal sheathing other than lead will give full protection . . . **Westinghouse** ships fuel elements for Belgian 11.5-Mw thermal power plant.



Con Ed Gets I-T-E Units

One of 18 air magnetic circuit breakers is shown above being readied for shipment to Consolidated Edison. Made by I-T-E Circuit Breaker, the units are rated at 1000-Mva interrupting capacity, 13.8 kv.

(*More Procurement & Products, p* 98)



Safely grounded...with

CF&I Galvanized Steel Strand

The CF&I Image—a giant steelman—stands for the dependability that's built into all CF&I steel products. One of them—Galvanized Steel Strand—is a safe, sure way to ground electrical installations and equipment.

Available in seven- or three-wire constructions, CF&I Galvanized Steel Strand for ground wire is made in accordance with ASTM Specification A-363. In addition, it can be produced to *your particular specifications.*

CF&I Galvanized Steel Strand, (made to ASTM Specification A-122), is also recommended for guy and messenger wire, and is available for quick delivery either from a nearby CF&I warehouse or from your local electrical distributor.

6931-A

GALVANIZED STEEL STRAND
THE COLORADO FUEL AND IRON CORPORATION

In the West: THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise Butte • Denver • El Paso • Farmington (N. M.) • Ft. Worth • Houston Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City Phoenix • Portland • Pueblo • Salt Lake City • San Francisco San Leandro • Seattle • Spokane • Wichita

In the East: WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

CF&I OFFICE IN CANADA: Montreal

CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg

Only Westinghouse offers all these Bonus Values in new Isolated Phase Bus

Single Insulator for Most Reliable Insulation. Use of the single insulator support minimizes the number of vulnerable points for electrical failure. Minimum short circuit stresses on insulator assured by the shielding effect of the aluminum enclosures. Resiliency of mounting brackets further limits stress on supporting insulators.

Dust-Tight Sealing Assured. Longitudinal gaskets have been eliminated. Multiple-line contact of gasketing assures perfect seal against moisture or dust entering enclosure, which maintains insulation level.

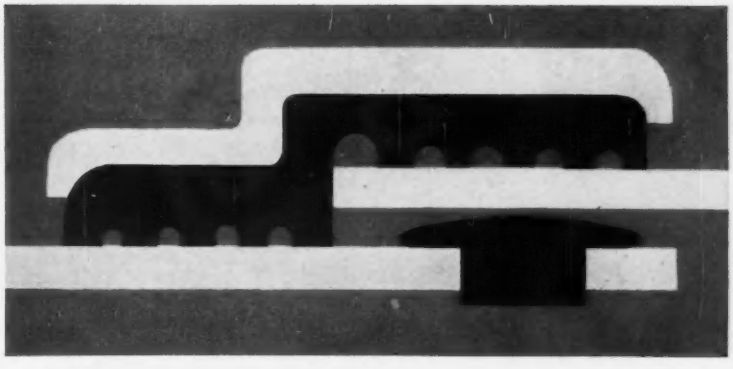
Enclosure Easily Welded in the Field if Desired. No extra parts required to weld telescoping sections for completely sealed installation initially or at a later date. The aluminum bus can also be welded for solid or flexible connections at joints.

Unique Mounting of supporting feet eliminates openings through the enclosure that would require subsequent sealing.

For further information, call your Westinghouse sales engineer or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60972

Pressure Applied Directly to Gasket for Best Seal. Specially extruded, continuous neoprene rings provide a series of narrow band contacts for excellent seal around full circumference of housing. The clamping band of heat-treated extruded aluminum alloy gives uniform pressure on sealing ring. Plastic spacers insulate housing against circulating currents at joints. Adequate clearance between inside and outside housings makes telescoping easy.

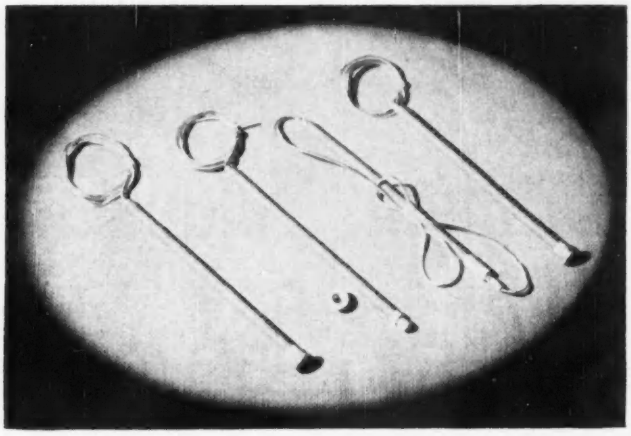


YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

Mr. H. H. Rugg, Assembled Switchgear Design Engineer, points out simple, sturdy support for Westinghouse Isolated Phase Bus housing and insulator.

(For further information refer to Readers Service on page 102)

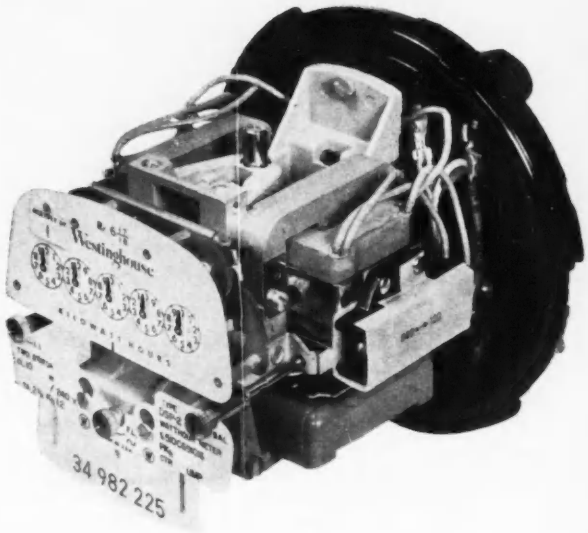


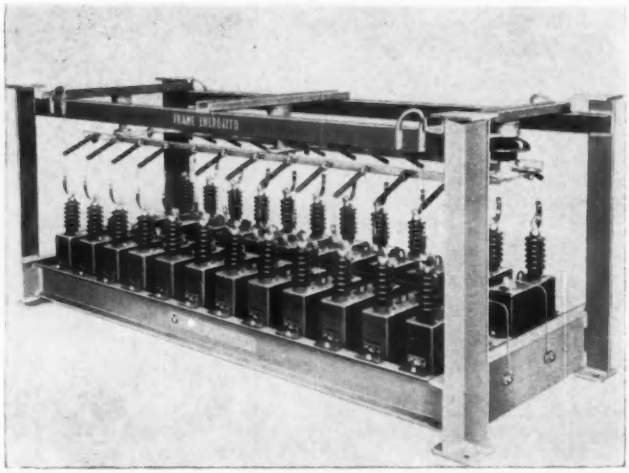
Fuse Link . . .

. . . with a removable button head is designed for use with all modern open and enclosed distribution fuse cutouts. More positive low current clearing is possible because of a longer auxiliary tube than on previous units and an internal spring on fuses up to 20 amp. The tube is sealed at the top of the cable-type link to prevent gas from escaping.
General Electric Co, Schenectady 5, N. Y.

Watthour Meters . . .

. . . for 120, 240 and 480-v polyphase operation in a new line feature resistance to corrosion. Frames are protected by "Epodur" thermosetting epoxy ester enamel. The line includes a universal meter for 120, 240 and 277-v circuits. The universal meter has a dual-rating voltage coil and a series-parallel switching device. It can be used on both 120 and 240-v circuits without recalibration.
Meter Department, Westinghouse Electric Corp, Raleigh, N. C.





Capacitor Blocks . . .

. . . are designed for use with 25-kvar units in open-type banks at transmission, subtransmission and distribution voltages. A standard block consists of two rows of 25-kvar units, 5 or 8.7-kv class, connected in parallel and mounted in a welded aluminum frame. Available blocks have capacities of 250 through 700 kvar in increments of 50 kvar.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wis.

(*More New Equipment on page* 100)

Giant generator gets new coils by National

...The Specialists in electric coils/repair service

When one of Bonneville Dam's big waterwheel generators required rewinding, National's experience in coil design and production was put to work.

National built a complete set of stator windings, comprising 594 coils, plus circuit rings and connection taps and furnished complete winding supplies. All coils were given high frequency tests at 10,000 volts, to check turn-to-turn insulation, and 40,000 volt ground test A.C. 60 cycle for one minute.

National also furnished supervision for installation. Despite limitations in working space—the rotor was not removed from the machine but was jacked up sufficiently to permit winders to enter—the work was completed on schedule. Generator No. 10 is now back in service—and is running several degrees cooler than before rewinding.

Put National's broad experience to work on *your* winding needs.

For more information call National's Columbus plant... HUdson 8-1151. Or call the nearest National field engineer.

National Electric Coil

McGRAW EDISON

DIVISION OF McGRAW-EDISON COMPANY

COLUMBUS 16, OHIO

ELECTRICAL ENGINEERS • MANUFACTURERS OF ELECTRICAL COILS, INSULATION, LIFTING MAGNETS • REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

LABORATORY CONTROLLED...

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana

Earth Probe . . .

. . . accurately determines soil conditions. It is used to find the correct classification of the soil before an anchor is installed. The Probe is a 5-ft rod with a screw-type head. It is screwed into the ground to anchor depth with a special wrench equipped with a torque scale. Torque readings are translated into soil classifications using a conversion table attached to the flap of the carrying bag. Extension rods are supplied with the tool.
A. B. Chance Co, Centralia, Mo.

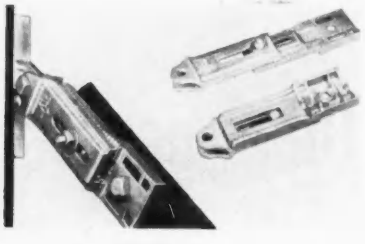
Trenching Tool . . .

. . . cuts a narrow trench about 1 in. wide to variable shallow depths. Known as the TrenchSAW, the device is powered by a portable high-speed, 2-cycle engine which can be detached and used as a chain saw. It weighs less than 70 lb complete with engine and can easily be handled by one man. Because of the small amount of dirt removed, the trench is easily backfilled with a garden rake.
Auburn Machine Works, Inc, Auburn, Neb.

Mounting Bracket . . .

. . . is adaptable to any street light control mounting arrangement where mounting directly to the luminaire head is not practical. The Model

5920 is ⅛-in. hot dipped galvanized steel. The twist lock conforms to EEI-NEMA standards and has three prewired 22-in. No. 10 leads for connection to line, load and neutral lighting circuit.
Ripley Co, Inc, Factory St, Middletown, Conn.



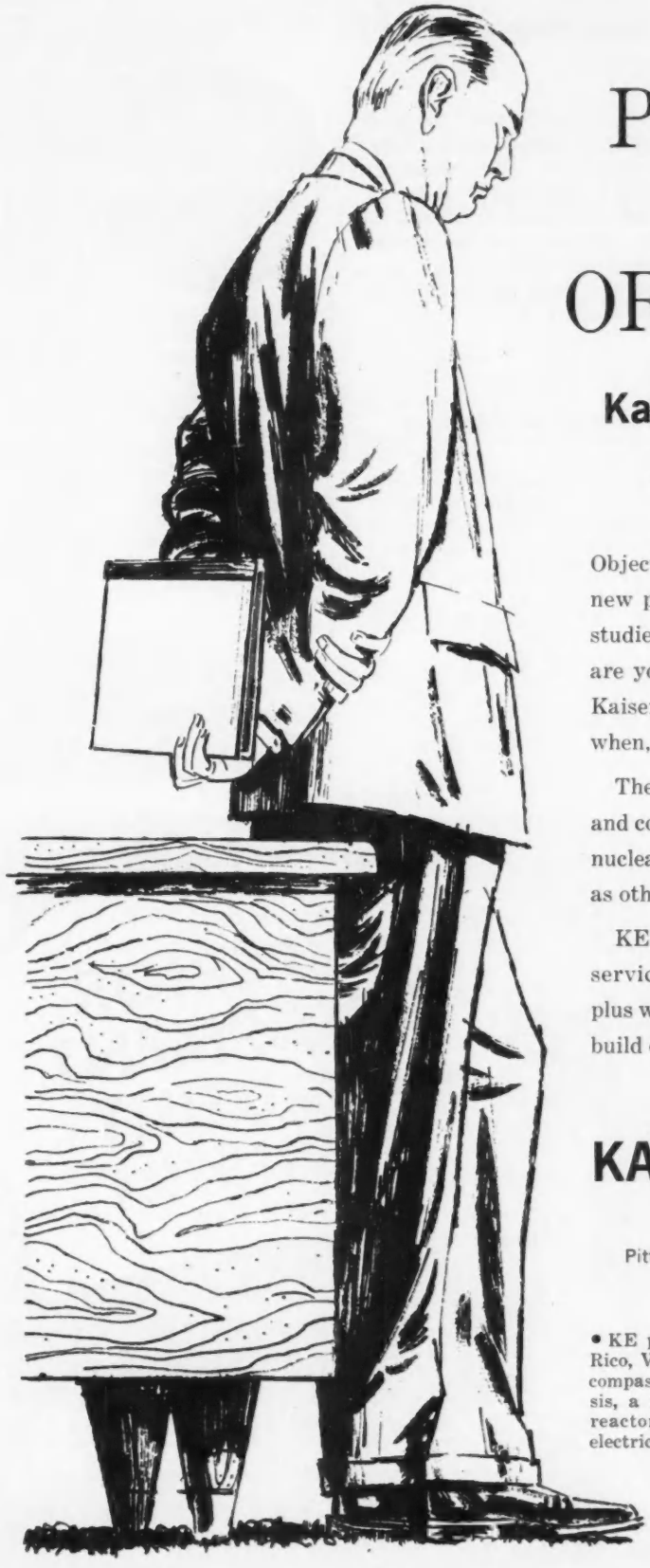
Adjustable Link . . .

. . . for heavy duty H-frame construction permits relatively low cost erection even with moderately irregular members. By using the MIF Adjustable Link, up to a 6-in. adjustment is possible at each end of the inner and outer braces of the H-frame superstructure.
Malleable Iron Fittings Co, Branford, Conn.

Neoprene Compound . . .

. . . fuses rapidly on application into a single mass of insulation, which can be shaped and molded by hand to conform to irregular shapes and

(Continued on page 102)



PROCEED, DEFER OR MODIFY?

Kaiser Engineers can help you decide

Objective analysis is vital to sound decision on new power generating facilities. Feasibility studies, economic analyses and site evaluations are yours by an outside, impartial firm when Kaiser Engineers is selected to help you decide when, how and where to proceed.

These services are in addition to the design and construction of all types of power plants—nuclear, fossil fuel and hydro-electric—as well as other nuclear facilities.

KE offers complete, one-company, integrated service from concept through construction—plus world-wide experience and the ingenuity to build quickly, within budget.

KAISER ENGINEERS

Division of Henry J. Kaiser Company
Oakland 12, California
Pittsburgh, Washington, D. C., Chicago, New York

• KE projects include work in Ghana, Japan, Puerto Rico, Vietnam, as well as the United States. They encompass such diverse assignments as nuclear fuel analysis, a nuclear research center, plutonium production reactor, steam-electric power station and a hydro-electric plant.

5458-P

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

General Electric .....Fuse Links ☐
Westinghouse .....Meters ☐
Line Material .....Blocks ☐
Chance .....Probe ☐
Auburn .....Trenching Tool ☐
Ripley ..... Bracket ☐
Malleable Iron .....Link ☐
Bishop .....Compound ☐

OTHER

_____

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Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* **Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.**

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FOR:
Reference ..... ☐
Specs ..... ☐
Trial ..... ☐
Purchase ..... ☐

OCTOBER 19, 1959

Neoprene Compound . . .

(*Continued from page* 100)

contours. Called "Neofil," the product is substantially thicker than other tapes (it is ⅛-in. thick) and produces a solid wall of insulation with only one wrap. It is ideal for use as a one-wrap service-entrance connector insulation.
Bishop Mfg Corp, 52 Canfield Rd, Cedar Grove, N. J.

More New Products

Wire pulling **compound** lubricates conduit without injury to insulations or personnel. A vinyl glove is included with each gallon can of "Wire Glide".—Electrical Fittings Corp, 37-50 57th St, Woodside, N. Y.

Annunciator has no moving parts. The STATALARM is completely transistorized and can be used on several voltages.—Lundell & Co, Box 156, Mt. Prospect, Ill.

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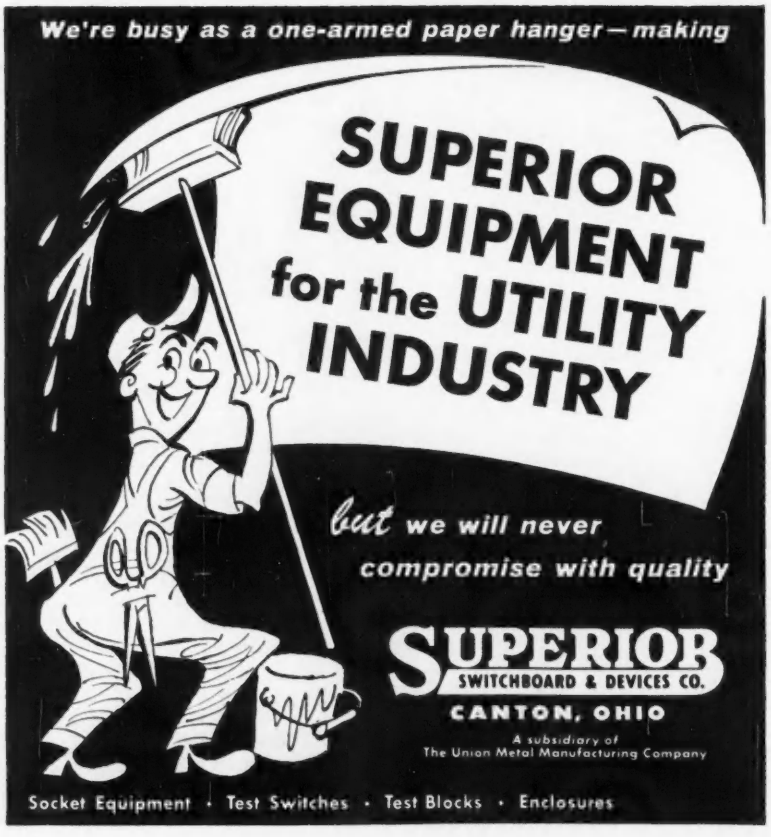
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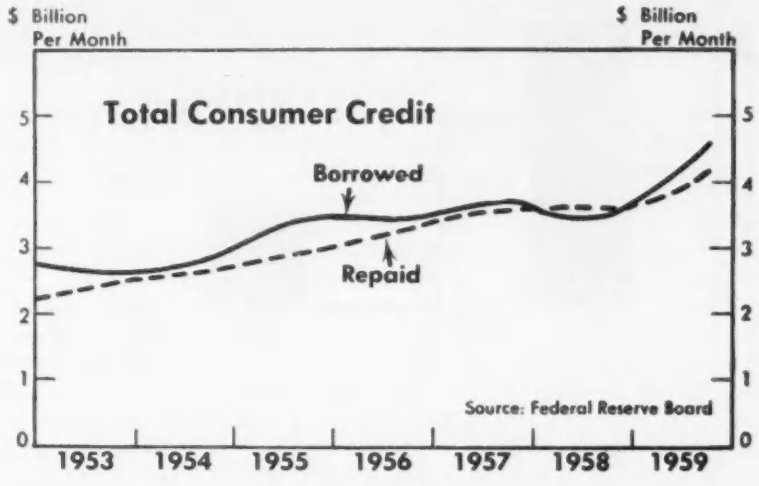


Consumer Credit Surges Upward

Report on
Electrical Business Outlook

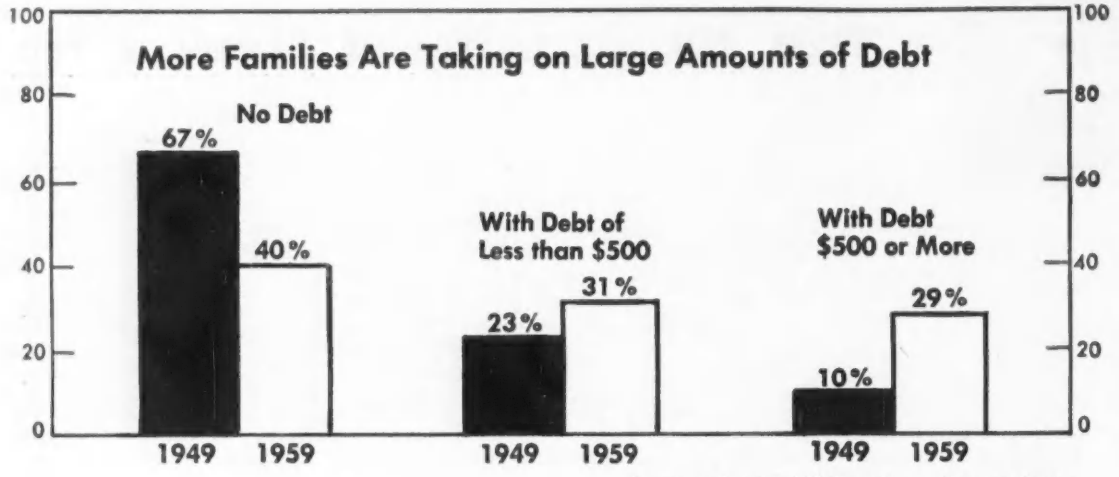
The availability of consumer credit and the consumers' willingness to use it have been one of the most important contributing factors to the economy in the post-war period. Of course, since this is borrowing against the indefinite future, consumer credit becomes a significant factor to be reckoned with in attempting to predict the height and duration of any economic boom. Consumer credit is the means whereby consumers can borrow against future income so as to enjoy the fruits of the higher standard of living today rather than wait until tomorrow when funds become available.

And right now consumers are off on another credit-buying spree that shows signs of rivaling the record credit boom of 1955. With personal incomes hitting new peaks and confidence apparently strengthened in the business outlook, consumers in the past few months have shown increasing willingness to buy appliances, automobiles, and other durables on time. By the end of August, consumer credit had reached a record level of $47.9 billion. The current rate of increase would bring the total amount of credit outstanding to $50 billion by the year-end.

Not only has total consumer credit reached record levels, but, with the exception of charge accounts, all types of credit were at a record high at the end of August. (Consumer credit includes charge accounts and single-payment loans as well as all types of installment loans.) Up to August of this year, credit outstanding for autos was up 14%, credit for other consumer durable goods (including appliances) rose 3%, repair and modernization loans increased 8%, and personal loans were up 9%.

Since total credit outstanding includes old debts as well as new borrowing, an even more significant indicator of how fast credit is increasing is the amount of new borrowing in recent months. (This can be seen in the chart above.) The annual rate of new borrowing is nearly 30% higher than it was last year—$49 billion at the end of August, compared with $40.5 billion in 1958.

More people are using credit. This is indicated by the surveys of consumer finances made by the University of Michigan Survey Research Center for the Federal Reserve Board. In 1949, 67% of all families had no consumer debt at



Source: University of Michigan Survey Research Center

all. Through the past ten years this figure has declined almost steadily. By early 1959 only 40% of all families had no debt. Moreover, the number of families holding large amounts of debt has risen fairly consistently during this period. In 1959, 19% of all families had debt amounting to $1,000 or more, compared with only 6% having this much debt ten years ago (see chart above).

Even though more people are using more credit, we must not overlook the fact that consumers are repaying the debt at a record level. Repayments are probably the best direct measure of the burden consumers are taking on. As the chart on the bottom of the next page shows, repayments as a percent of income after taxes are now just above 13%—about 1% higher than in the 1955 credit binge. This does not mean that a "ceiling" has been reached. Because of higher incomes, more people can safely use credit—and in larger amounts—than in the early post-war period. The fact remains, however, that installment debt repayments are taking a near-record proportion of consumers' income.

How much of a dent tight money conditions will put on consumer buying still is a question. But apparently it would take more of a jolt than anything the experts foresee to dampen the enthusiasm of consumers for time-payment buying at this time.

Consumer borrowing may well represent the most urgent demand for funds in the money market as we move into 1960. By then, the federal Treasury will have its seasonal deficit behind it and will be moving toward a balance between expenditures and revenues. Business borrowing will be active—both to finance new inventories and for capital spending. Electric utility companies expect to spend $3.4 billion for new construction in 1960. To help finance part of this construction work, these companies may be in the money market for about the same "new money" that they raised in 1959, namely, $1.5 to $2 billion.

However, because of the large amounts of internal funds from profits and depreciation, there is no sign at the moment that other corporations plan to do as much outside financing as they did in the capital spending boom of 1956. The surge in new extensions of consumer credit is straining the money market already, both through direct consumer borrowing from banks and in the lending of finance companies. Sales finance companies normally borrow from banks or other large lenders to get the funds they pass along to consumers. Because of the large amounts of money they require in an already tight market, the sales

finance companies have had to pay higher interest rates on the money they borrow, but they will continue to be vigorous competitors for the available funds.

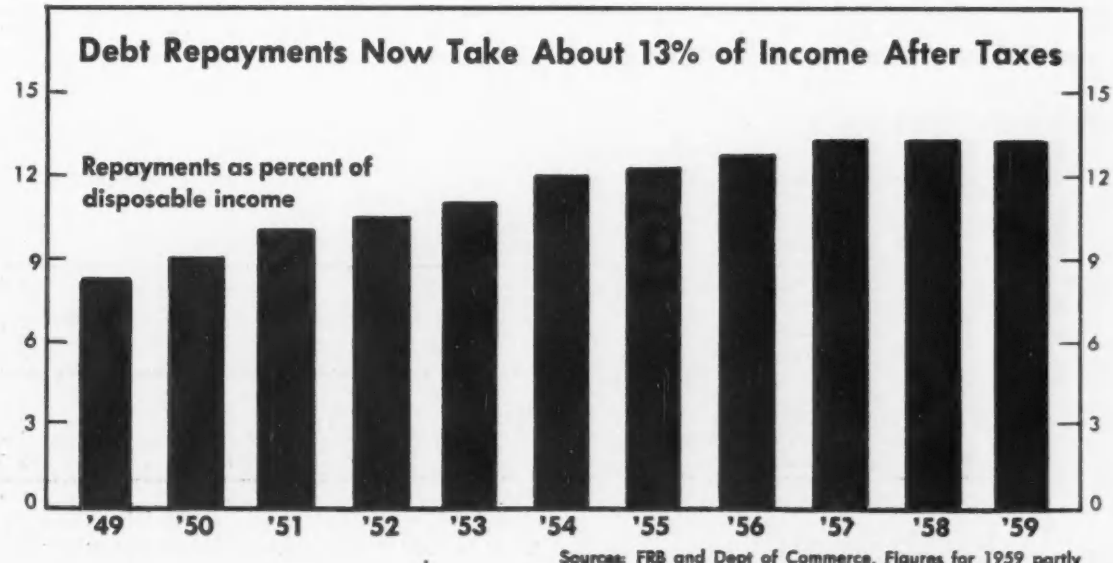
Finance companies will be able to get funds for consumer lending, it appears. The larger ones, at least, are "top names" among corporate borrowers. The commercial banks also will continue to provide funds for consumer loans, despite their tight reserve position, because this type of loan is among the most profitable.

Even though tight money does not now pose any serious threat to the availability of consumer credit, it may exercise a bit more restraint on consumer lending than it has in the recent past. Some consumers may actually notice the size of the interest charge. And some smaller banks and finance companies may be so short of funds that they will decide to go easier on soliciting new consumer business. Prodding from the Federal Reserve Board may prompt the same sort of restraint on the part of larger banks.

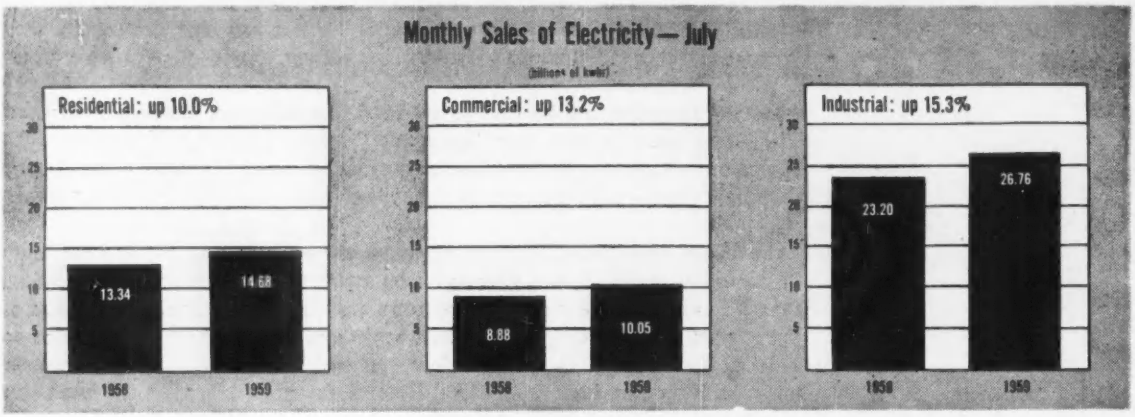
Federal Reserve Board officials are keeping an eye on the expansion in consumer credit, with the view that it adds inflationary tendencies to the economy. But the Board has no desire to seek credit controls, preferring to rely instead on standard monetary policies to hold down inflationary pressures. One big reason for this is that Fed officials feel the expansion in credit so far is more or less normal for this phase of the business cycle. This is in contrast to 1955 when a general easing of credit terms and a stretchout in repayment periods created the spark that led to a rush into credit and an expansion in sales.

These are our conclusions on consumer credit:

- The rise is due basically to the general improvement in economic climate and is going hand-in-hand with rising sales of appliances, autos, and other things consumers buy on credit;
- It seems inevitable that increases in consumer credit over the next several months will nourish a further rise in sales of durable goods which is not sustainable; and
- Tight money is not likely to have much effect on the volume of consumer credit, though increasing demands for consumer credit may aggravate the problems of the borrowers.



Sources: FRB and Dept of Commerce. Figures for 1959 partly estimated by McGraw-Hill Dept of Economics



Power Statistics

		Latest Month	Year Ago	Annual Change %
Capacity	July	151.53	135.06	12.2
Peak—Class I Systems, million kw	Dec.	107.1	102.4	4.6
Estimated Dec. '59 Peak	July	124.7	127.9	−2.5
Production—billion kwhr	July	61.69	54.99	12.2
Hydro		11.48	11.61	−1.1
Fuel		50.21	43.38	15.7
Sales—billion kwhr	July	54.74	48.34	13.2
Residential		14.68	13.34	10.0
Commercial		10.05	8.88	13.2
Industrial		26.76	23.20	15.3
Other		3.25	2.92	11.3
Fuel Consumption	July			
Coal—million tons		13.63	12.04	13.2
Oil—million barrels		6.00	6.10	−1.6
Gas—billion cu ft		182.19	153.78	18.5
Net Income Class A & B Co's—$ million	July	122.11	110.58	10.4
Residential Customers—millions	12 mos	48.28	47.14	2.4
Revenue per kwhr	ended	2.52¢	2.53¢	−0.4
Avg kwhr per customer	June 30	3,470	3,300	5.2
Avg annual bill		$87.44	$83.49	4.7

Business Statistics

Indexes: 1947–49 = 100				
FRB Industrial Production	Aug.	147	136	8.1
ENR Construction Cost	Oct.	170.1	162.5	4.7
BLS Cost-of-living	Aug.	124.8	123.7	0.9
New Orders for Machinery (1950 = 100)	Aug.	150	139	7.9
NEMA Sales				
Insulation materials	July	131	90	45.6
Electric appliances		114	99	15.2
Wholesale prices				
Motors and generators	July	145.9	146.5	−0.4
Transformers and regulators		149.7	147.6	1.4
Switchgear and fuses		178.9	173.8	2.9
GNP—annual rate—$ billion	2nd Qtr	484.5	434.5	11.5

Significant changes: The index of wholesale prices of motors and generators continued to dip for the second month in a row. It was off 0.4% same as the previous month.

Is Yard Pole Key To Adequate Farm Wiring?

Overloaded wiring and antiquated farmstead entrances are becoming serious to the American farmer, according to G. T. Rosenlund, Hi Products, Inc. The new appliance load, plus additional load from new labor-saving devices such as milk coolers, barn cleaners, crop dryers, water heaters and material handling systems is compounding the problem.

These hazards, coupled with the increased outage service call problem of the power supplier, warrants a long look at up-rating both farm entrances and wiring well beyond the immediate requirements.

The majority of the power suppliers in the upper Midwest, noting the increasing farm electrical loads, has adopted the pole-top metering principle, Rosenlund says. This remote current transformer metering system eliminates the bottleneck of the conventional meter loop entrance. The installation cost of the heavy conductor run down the pole to the meter and up again in conduit has brought many entrance installations of a rating just over present needs with the full knowledge that further up-rating will be necessary within a few years. If adequate wiring had the consumer appeal of a gleaming new refrigerator the cost of the entrance size would create a lesser problem, he notes.

To get around this entrance size question, most power suppliers in this area have gone to the pole-top metering yard-pole arrangement. This system best answers the needs of the farmstead service entrance whether the farm service wiring remains overhead or goes underground. In most cases the yard pole (centralized service pole) serves a multiple purpose:

1. It becomes the transformer pole to eliminate secondary line loss

2. It is the meter pole with current transformer mounted at service position and meter at conventional eye level

3. Its central yard position makes it ideal for primary yard lighting (preferably with photo-controlled luminaire)

4. It forms a natural distribution point for all farmstead wiring.

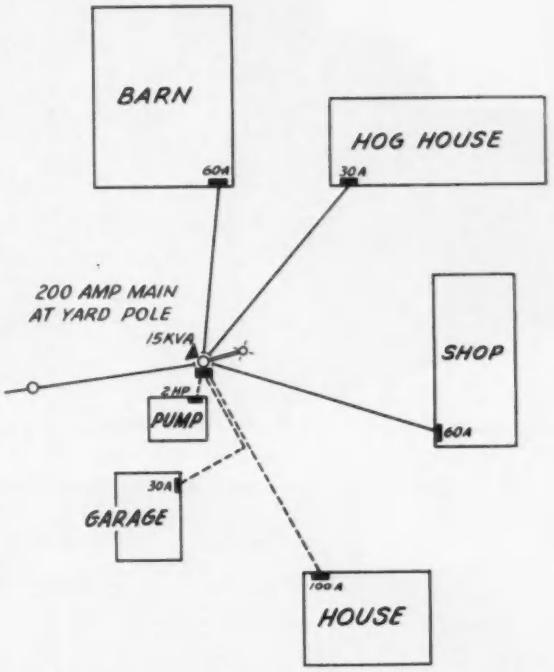
Aside from these obvious advantages of the yard pole installation, the power companies now using the remote or pole-top metering system find other improvements over the conventional meter loop. It does away with the question of amperage rating size of the loop. The drop from current transformer down the pole to the meter need be only four #12 or #14 conductors to carry a maximum 2½ amps and meter potential to the 2½-amp rated meter.

If the service is rated for 100 or 200 amps, any further increase in rating can be accomplished by changing the CT ratio with no need to increase pole drop conduit size. No multipliers are needed with the 2½-amp meter, reducing the chance for reading error, especially where the meter is read by the consumer.

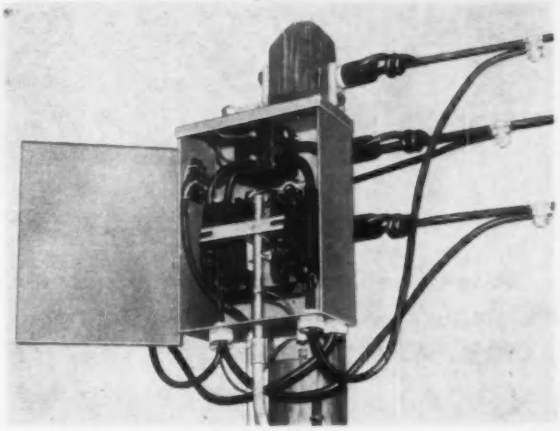
The CTs can carry 240% of their rating while the meter itself can carry 400% over rating with acceptable metering accuracy. The installation cost is less than the conventional loop and further up-rating is accomplished with little added expense.

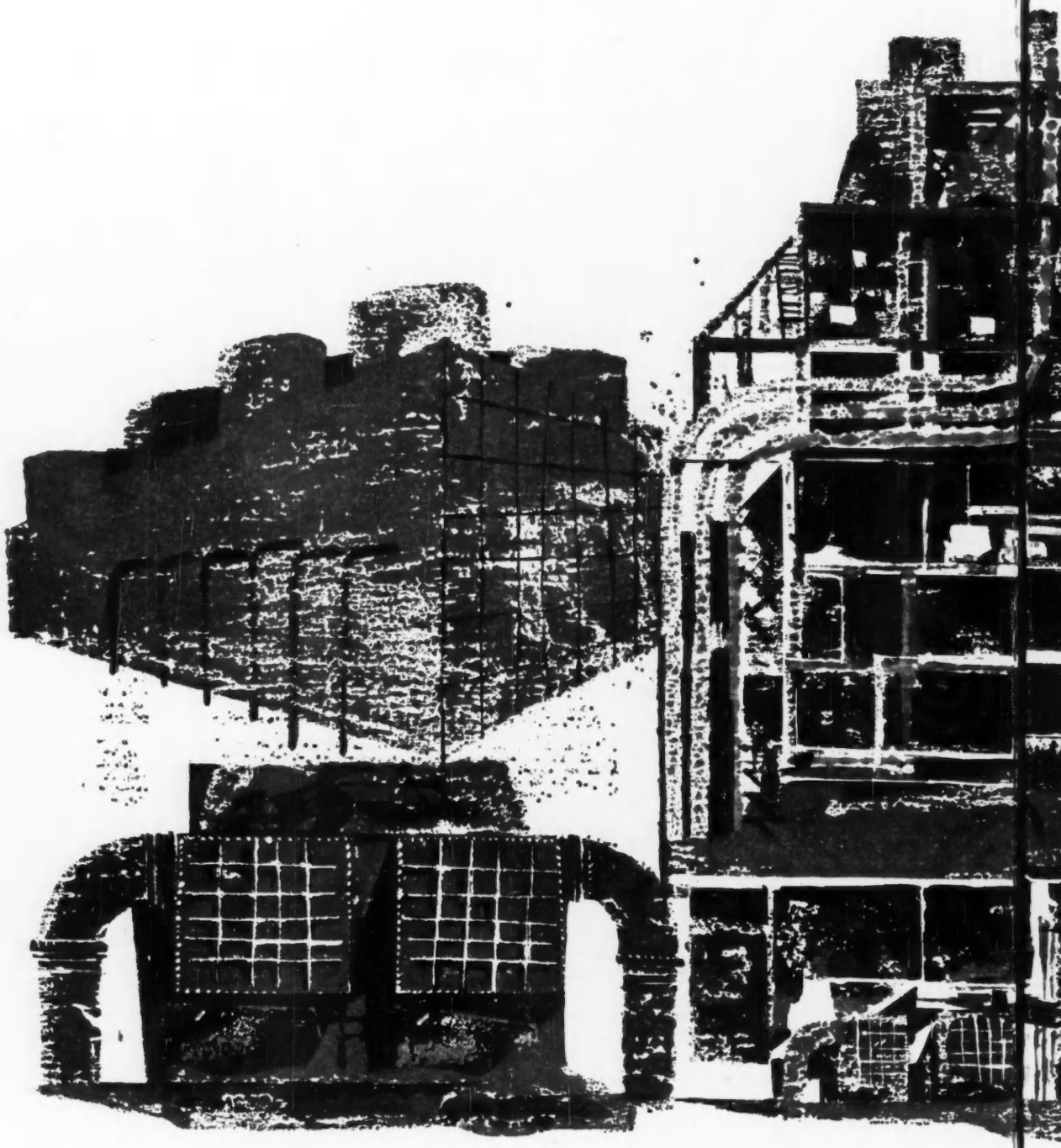
To further simplify, reduce initial cost, and increase user safety and convenience, a new pole-top metering and circuit breaker cabinet for pole-top mounting has been introduced. The National Electrical Code does

(*Continued on page* 110)



YARD POLE cabinet (below) forms natural distribution point for all farmstead wiring as shown above





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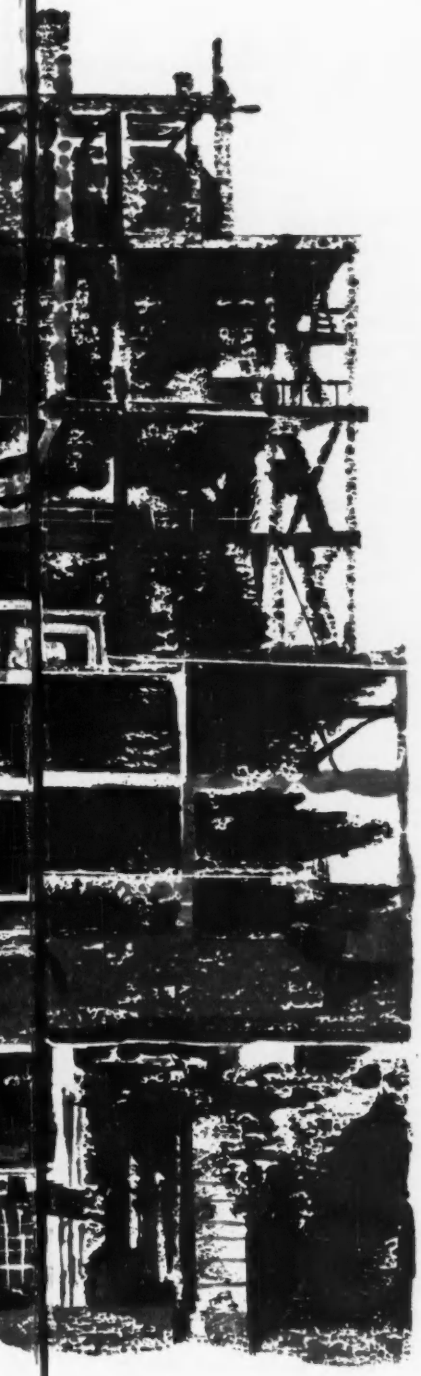

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Is Yard Pole Key to Adequate Farm Wiring? (*Continued from page* 107)

not require a switch at the service pole if each service drop has an entrance switch in the building it serves. However, using the pole-top circuit breakers at the service pole has the added safety of electrically isolating the main source of overloads and short circuits, the farm-yard, from transformer protective devices. This pays off in fewer service calls and less frequent and shorter (time-wise) consumer outages.

When the pole-top metering and circuit breaker cabinets are installed with a comparable rated transformer, the electrical faults arising from the farm wiring system trip out the pole-mounted breakers. This saves the transformer protective devices from opening and the inevitable outage service call.

This pole-top circuit breaker cabinet has a ground-level disconnect-reset handle. The consumer can correct his electrical fault, reset the breakers, and be back in operation before a service truck could be dispatched under the older, conventional system. This equipment also saves the power company from sending a man and truck to disconnect a consumer at the transformer while he makes repairs or additions to his wiring system. The consumer himself can disconnect his entire system at the yard pole and lock the breakers "on" or "off."

With these pole-top disconnect breakers the water pump is normally connected on the source side of the breakers. This is done for added safety in case of fire in any of the farm buildings. Power can be disconnected at the service pole to forestall any spreading of fire through overheated conduit or conductor short circuiting and arcing.

The 200-amp single-phase cabinet contains a 200/5 CT ratio two-cross connected 100-amp, 2-pole, industrial-type circuit breakers, bussed in a parallel arrangement that insures a combined full 200-amp rating and a complete trip out in case of electrical fault. The complete installation cost of the cabinet, controls and meter for this 200-amp service is less than a 100-amp conventional meter loop. Equipment is also available for 200 amp, three phase, 400 and 600 amp, single and three phase.

Policies vary among power companies as to whether the pole-top cabinet is purchased by the consumer or whether the company installs and retains ownership. A policy that has worked well with some is that the company will provide and install the pole-top equipment, free of charge subject to these conditions:

1. The consumer must install in house or barn (or location of heaviest load) a minimum of 100-amp fuse cabinet

2. Consumer must have installed a minimum wire size depending on voltage drop to feed ample capacity to all buildings

3. Proper inspection must be made of all wiring.

The power supplier, when notified that these conditions have been met, cooperates with the contractor so that entire installation can be completed at the same time. A policy such as this forestalls placing a 200-amp service entrance to supply service wires designed for 60 and 100-amp maximum load. The money the consumer saves on the entrance equipment can then be applied to adequate service wiring and proper size building entrance cabinets. The cost to the power supplier is insignificant when the increased service capacity is considered in the light of possible expanded kwhr use, Rosenlund says.

Because of its numerous advantages, most of the power suppliers using the yard pole, with pole top metering and circuit breaker cabinets, consider it the first hurdle on the road to adequate farm wiring.

SELLING BRIEFS

Fluorescent Lighting Assn will expand its membership services and inaugurate a promotion campaign. The promotion will be directed to architects, engineers, and contractors as well as large users of cold cathode lighting equipment, such as schools, banks, office buildings, restaurants and industrial plants.

General Electric Co has incorporated an acrylic refractor in its new mercury-vapor street lighting line. The refractor is designed not to shatter even under the impact of rocks, bullets, or from thermal shock caused by cold rain on hot refractor surfaces, according to GE.

Emerson Electric Mfg Co has a portable baseboard heater. Unit is 7½ in. high and 3 in. wide with a retractable handle. A safety signal light tells when the heat is on.

Central Power & Light Co's South Texas service area has installed its 1,000th heat pump. Customer was given an electric griddle in recognition.

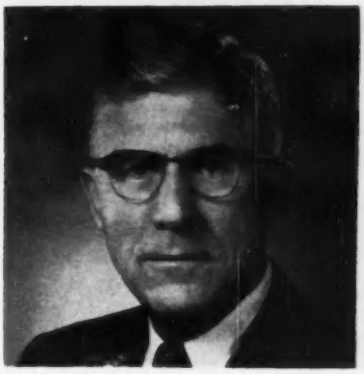
National Warm Air Heating & Air Conditioning Assn has instituted its Silver Shield Program in the Philadelphia area. The Silver Shield is the name given to a ducted warm air heating system that meets national standards and is guaranteed.

Frigidaire Division of General Motors Corp is going into the gas dryer business. Four automatic models are in production. "Although electric dryers currently outsell gas models by two to one nationally, there are certain localities where there is a strong demand for gas units," according to Herman F. Lehman, general manager of the division. He estimated that only 15% of U.S. homes have dryers today, with 4% being gas.

Westinghouse Electric Corp will produce an air-to-air 5-ton heat pump, "the first to be equipped with a new 'super-sensitive control system' that senses the outdoor temperature and regulates the indoor temperature accordingly."

Weatherproof electronic unit which converts yard lights to fully automatic on-off operation has been manufactured by Micro Balancing Inc, Garden City Park, N. Y.

Kussmaul Named VP-Purchasing & Stores



Walter H. Kussmaul has been named vice president of purchasing and stores at Northern Indiana Public Service Co. He will be responsible for all purchasing, general stores, transportation, building maintenance, and claims and investigations.

A 36-year veteran with the utility, Kussmaul was formerly vice president of division operations.

He began his career as a cadet engineer with the Calumet Gas & Electric Co, a predecessor of Northern Indiana Public Service Co. In 1929 he was made general storekeeper of NIPSCO. Seven years later he was appointed industrial relations manager, and in 1949 became assistant general operating superintendent. He was next made general operating superintendent. In 1956, he was appointed vice president of division operations.

Coe Made a Vice President of Anaconda

The Anaconda Co has made John A. Coe a vice president. He will continue as chairman of the board of directors of American Brass Co, an Anaconda subsidiary. Richard M. Stewart, president of American Brass, will become chief executive officer of the subsidiary.

Coe has been with American Brass since 1920. Beginning in the company's casting shop, he became a salesman in the mid-twenties and in 1936 was named general sales manager. In 1941, he was elected vice president in charge of sales, a post he held until the end of World War II. For the next five years, he was executive vice president of American Brass Co. He was president from 1950 until 1958, when he was elected to his present position of chairman.

Stewart has been with Anaconda since 1935.

PERSONAL BRIEFS

Mississippi Power & Light Co has made the following promotions: **J. P. Stephens** to administrative assistant to the president; **R. K. Hunter** to commercial supervisor, Meridan division; **W. C. Bounds** to assistant division manager, Laurel division; **H. H. Bell,** administrative assistant to the Gulfport division manager; **J. E. Kizzire** to supervisor of land and construction; and **C. F. Stanford** to supervisor of transmission.

James Phillips has been appointed acting division manager of the Black Hills division of Montana-Dakota Utilities Co. He assumes the duties of **Portus Baxter** who is on leave of absence. **Norton Lawellin** has been named assistant to Phillips; **A. W. Zander** has been appointed chief accountant of the Black Hills division; and **Raymond C. Roberts,** chief accountant for the Miles City division.

Union Electric Co has promoted **Joseph W. Sischka** to methods supervisor in the methods section of the transmission and distribution office department; **William S. Strothman** to senior assistant engineer in engineering and construction; and **Earl J. Will** to senior assistant engineer in the regional department.

Public Service Co of Oklahoma has named **Bert H. Morphis** Bartlesville industrial power sales engineer and **Robert B. Burnaman** area new business manager. **Willard A. Baker** has been made design engineer in the construction and design department in Tulsa.

Duquesne Light Co has appointed **Thomas Hunter** superintendent of line engineering, transmission and distribution department. **James E.**

(*Continued on page* 112)

PAGE

FENCE

Fence value depends on
—quality materials
—quality installation
You get both from PAGE

New Aluminized Fabric!
(other quality fabrics available:
galvanized steel,
aluminum,
stainless steel)

8 basic fence designs
6 gate styles

Expert installation
by specialists

Registered Certificate
of Quality furnished
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Write for helpful booklet

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Dobson has been appointed manager, wage and salary administration and office operation section of the personnel department.

Fred R. McMillan has been named assistant general manager of Portland General Electric Co's customers' service division.

Sir Roger Makins will become chairman of the United Kingdom Atomic Energy Authority next January 1.

Robert E. Hollingsworth has been made deputy general manager of the U. S. Atomic Energy Commission.

Francis D. Pitts has been re-elected president of the Virginia Electric Co-operative. Other officers include **Alex J. Harris,** vice president, and **George Washington,** secretary-treasurer.

Clarence Noah has been appointed a member of the North Carolina Utilities Commission; also **Thomas R. Eller, Jr. Ralph Smith** has been made associate commissioner of the Alabama Public Service Commission.

Dr. Gordon Shrum, dean of graduate studies, University of British Columbia, has been named chairman of the five-man energy board being set up to advise the provincial government on power development, production and use.

Westinghouse Electric Corp has named a research committee to counsel top Westinghouse management on matters pertaining to research. Named to the committee were: **Dr. Cyril Stanley Smith,** professor of metallurgy at the Institute for the Study of Metals, University of Chicago; **Dr. Julius A. Stratton,** president, Massachusetts Institute of Technology; and **Dr. J. C. Warner,** president, Carnegie Institute of Technology.

Lloyd Skog has been appointed manager of the GE Weathertron Division of General Electric Co for northern California.

William W. Pedersen has become a full-time member of a new corporate planning committee at Dow Corning Corp. **Max H. Leavenworth** becomes manager of the Cleveland office, and **Edwin Haire** becomes manager of the Dallas branch.

John H. Covode has been appointed manager of sales-special products for the controls division of Hagan Chemicals & Controls, Inc.

Paul R. Totten has been made works manager of the Cleveland Mill Division of Chase Brass & Copper Co.

General Electric Co has appointed two specialists to the newly created marketing research, product and sales planning component of the marketing section of the gas turbine department. **Charles R. Dygert** has been named specialist-product planning, and **Kent L. Lewis,** specialist-advertising and sales promotion. **Lee H. Hill, Jr.,** has been appointed manager of sales for the service shops department.

George F. Krauss has been appointed advertising manager of the automotive division of Electric Storage Battery Co.

OBITUARY

Cecil A. Beasley, 83, former lawyer for several Southeastern power companies . . . **Richard E. Simpson,** 79, consulting engineer and director of Illuminating Engineering Society. He worked at General Electric Co's laboratories at one time . . . **Paul E. Shacklett,** 73, former official with the Tennessee Electric Power Co . . . **William Watson Davison,** retired official of the Georgia Power Co . . . **George N. Hawley,** 60, vice president of Southern California Edison Co.

Sadie E. Denman, 98, president of Ellenville Electric Co until early this year . . . **Paul W. Epperlein,** 59, manager of Consolidated Edison Co's tax department . . . **James Joyce,** 63, manager of the Adams-Marquette (Wisc.) Electric Co-operative . . . **Ralph E. Flesher,** 67, former employee of the Illinois Power Co . . . **Donald S. Turner,** night superintendent of Sangamo Electric Co.

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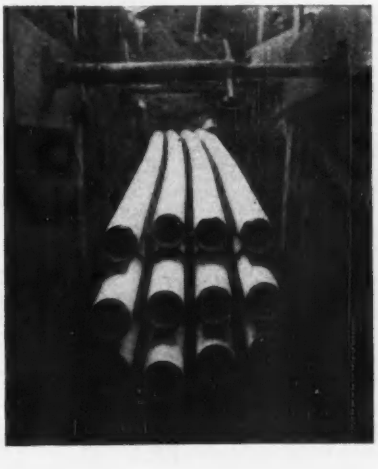

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Super-Hi™ lamps deliver their full light output regardless of their position in fixtures. They have a smooth, tubular surface, free from dust-catching pockets or indentations which quickly cut down the light. S.H.O.'s are rated at 7500 hours life. List price, $6.95.

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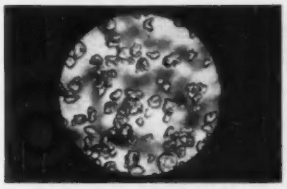
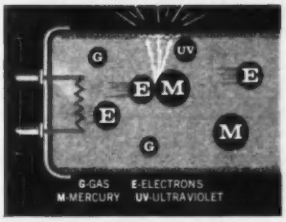
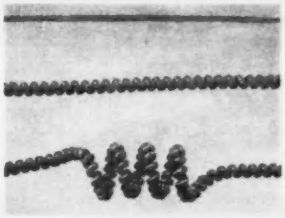


2. MIXED GASES. All fluorescent lamps contain mercury and gases. The gases serve as conductors until the mercury is vaporized. The combination of these gases and mercury vapor then converts electricity into ultraviolet radiation, which, in turn, causes the phosphors to "fluoresce," or light up. Westinghouse engineers have determined that a carefully proportioned mixture of several rare gases produces the best results. Westinghouse uses the right mixture and pressure for each type of fluorescent lamp.

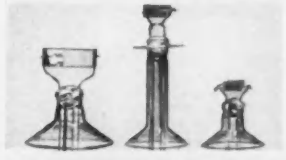


3. TRIPLE COILED ELECTRODES. When a fluorescent lamp is turned on there is a sudden initial bombardment of the electrodes by heavy mercury ions. To reduce this bombardment the emission material which coats the electrode must be heated. If the emission material is not protected, lamp life will be shortened. Westinghouse uses triple wound coils to make sure that the carefully determined amount of emission material is heated quickly and is adequately protected from bombardment.



4. PLATED LEADS. The terrific electron bombardment which takes place inside a fluorescent tube eventually causes particles of the metal supports and leads to sputter off and cause "end blackening." To prevent this, Westinghouse plates the lead wires with super-hard Chrome-Vanadium. Result: tubes that *stay* brighter, end to end.

5. "CUSTOM" ANODES. Anodes act as buffers to cushion the terrific shock of electron bombardment and prevent excessive "sputtering" of emission material from the electrodes. Since the electrical characteristics are different for each type of fluorescent lamp, Westinghouse anodes are especially engineered to fit the electrical requirements of each type of lamp.



6. SILICONE "RAINCOATS". Moisture is the invisible enemy of fluorescent lamps. In high-humidity areas, moisture can collect on the exterior surface of the lamp and prevent it from starting. To protect against moisture accumulation, Westinghouse fluorescents are given a special Silicone coating, or "raincoat," which disperses this film into harmless droplets.

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MORE LIGHT PER DOLLAR

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(cool white)

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Wanted—Graduate Electrical Engineers—Electric Utility in North Jersey area. Some experience in transmission and distribution desired. Please answer giving education, experience and salary expected. P-2345, Electrical World.

Electrical Engineer. Electrical Engineer with High Tension experience to manage Engineering Department for a manufacturer of Porcelain Insulators. Position includes full responsibility for design, testing and development of electrical porcelain. Replies confidential. P-2857, Electrical World.

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Registered EE by Consulting Engineers for Fairbanks, Alaska. Liberal subsidy to permit entering private practice. Incentives as free office space, secreterial service in new air-conditioned office building, guaranteed monthly income not less $700 for first year. Work from 2 architectural offices and ours. Send complete resumes. P-2852, Electrical World.

Wanted. Engineer and estimator for construction work involving power house transmission lines. Would like someone with private pilots license. Airplane furnished is a Beechcraft Bonanza, Model K. Please furnish resume. Company will pay travel expenses. P-2844, Electrical World.

SELLING OPPORTUNITIES OFFERED

Representative wanted for manufacturer of street lighting equipment pole line specialties. Full particulars. RW-9821, Electrical World.

Manufacturer's Agent—To represent old, established manufacturer of high tension, wet process electrical porcelain specialties (no standard insulator line) in Eastern Pennsylvania, New Jersey, Metropolitan New York, Delaware and Virginia. In applying, please give age and send recent photo. RW-2770, Electrical World.

Wanted. Salesman for electrical wholesale supply house to work either in Farmington, New Mexico or Casper, Wyoming. Prefer man with pilot's license, but this is not a condition of employment. Send replies to: Electrical City Supply, P. O. Box 1907, Farmington, New Mexico.

POSITIONS WANTED

Electric Utility Rate Engr.—Graduate EE, MS Business Management, 4 years rate engrg. 12 years utility engrg, age 38, NYC area preferred. PW-2861, Electrical World.

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the box number when answering advertisements. It is the only way we can identify the advertiser to whom you are writing.

Barnstorming by CEI Aims to Boost Area

Six-man team is visiting 15 cities with film preview of industrial 'corridor's' advantages

Last month, the Cleveland Electric Illuminating Co invited executives of a chemical company to see a New York showing of a new film about the utility's area. On the basis of the invitation alone, CEI got a reply inquiring about two plant sites totaling 1,600 acres.

Results such as this are a main objective of a six-man CEI area development team which hopes to interest some 7,000 industrialists, investors and commercial executives in relocating in northeast Ohio.

Equipped with movies, literature and a fact-filled sales pitch, the corps is visiting Philadelphia, Boston, Hartford, Detroit, Chicago, Milwaukee, Pittsburgh, St. Louis, Dallas, Los Angeles, San Francisco, Washington, D. C., Toronto and Montreal. Back on the home front, seven other members are working with 48 industrial firms which "could mean as much as 5-million sq ft of new plant space and an investment of $100 million," says Dick DeChant, area development department manager.

The new movie, "Cleveland Corridor," describes facilities of four world port cities, five mainline railroads, 11 airlines and more than 150 truck lines serving the 10 by 85-mile area from Cleveland to the Pennsylvania border. This is backed by more detailed films on the ports and on the corridor's existing chemical complex.

NEW MOVIE extolls sites along 85-mile long strip

CEI is putting $80,000 of its $200,000 area development budget into advertising and promotion this year. One indication of the investment return is seen by committments for "more than $82 million for new plants and expansion in northeast Ohio in the first eight months of this year," observes DeChant.

Housewives Quizzed on Utility Views

Utilities can't afford to relax their sales promotions, judging from views of a panel of housewives who were quizzed on appliances recently at an Ebasco sales and public relations workshop. Few of the women had even heard of Live Better Electrically, Housepower or other campaigns, including those on gas. While lacking facts on these and other industry matters, their attitudes were favorable to private companies. The panel as a whole did not like government operation of utilities, thought electricity and gas were the housewife's best bargains, and generally agreed utilities are doing a good job. Bob Wood, Ebasco sales consultant, is moderator for the session above.

UN Study Delays Chocon Project in Argentine

Decision on the 700-Mw Chocon project in the Argentine, which French interests have offered to finance and construct, will be delayed until World Bank experts issue their report of a survey which has been authorized by the United Nations.

The UN has allotted $250,000 from its Special Development funds for a complete new study of Argentine power requirements. The Argentine government will contribute $50,000 toward the cost of this survey, which is expected to be completed in five months. The World Bank will administer the funds and provide experts to draw up the report, said George L. Sundelin and Mario Picelli, Directors of the World Bank, on a visit to Buenos Aires.

The survey will determine Argentine power requirements for the next 10 years, and recommend both emergency and long-range measures to be undertaken by private and state electric companies to keep abreast of growth.

Microwave Operation Resembles Billiard Cushion Shots (*Continued from page* 61)

control and relaying channels, all stations have continuously rotating power units except one. The latter takes standby power from a large cold-start diesel unit. Three are ac motor-ac generator-gas engine flywheel type and five are ac motor-ac generator-dc motor type utilizing heavy-duty station batteries.

Controls are both frequency and voltage relays. The units return automatically to normal drive upon return of power and transfer to an alternate source and shut down on internal failure.

Gas Turbine Generators Meet Peaking Requirements (*Continued from page* 63)

fuel consumption of such equipment was of little importance.

Principal requirements of the machines are maximum capacity, simple operation, quick starting, and low maintenance. No heat recovery or other unessential equipment was included. Since the introduction of natural gas into the area appeared to be imminent, specifications provided for burning either distillate oil or natural gas. The units can be switched from one fuel to the other, without interruption, while operating under load.

Installed cost of the gas turbine generators was $3,600,000 or $110 per kw of nameplate capacity.

Curves Show Flicker Limits (*Continued from page* 64)

narrow band is predicated upon 1934 data. The dashed curve indicates voltage flicker limits proposed recently to the EEI by one utility. Points above the dashed line represent the upper limit of permissible flicker voltage stated by two utilities.

The acceptable voltage flicker limit should lie above the heavily outlined area, close to the dashed curve. Installations producing a flicker voltage within or below the heavy curves are not objectionable. Flicker voltages between the solid and the dashed curves are not objectionable. No further upward revision appears practicable.

Squeezes Site to Get Capacity (*Continued from page* 67)

largest size available, to 2,500 amp, to match transformer emergency capabilities. Blowers are turned on at a preset current.

Initially, only one bus and part of the second and three transformers were installed at LaSalle. Two additional 12-kv lines and a transformer will be the next step of development. The remainder of the 12-kv lines will be installed as required by load growth. The bus-tie breaker between the two buses will be operated normally open after the fourth transformer and other lines have been installed. This opening limits to some extent the magnitude of available fault current. When fully developed, this substation will supply two network areas of about 80 Mva each.

Since LaSalle substation was placed in service, and because the dc load is continuing to decrease, the utilization of other dc substation sites in a similar manner is being considered. The availability of 1,000 Mva cubicle-type air circuit breakers will increase the latitude in planning their maximum development.

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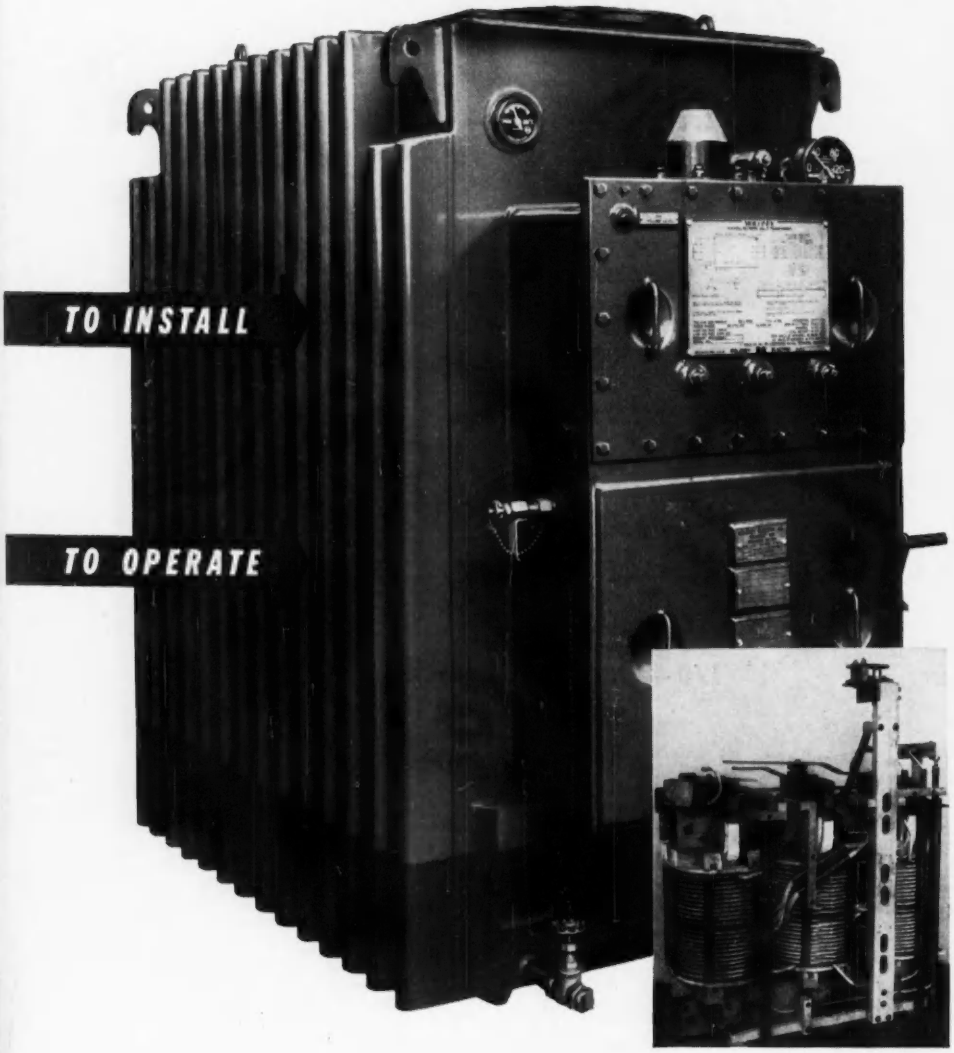

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